ALAGAPPA UNIVERSITY

(Accredited with 'A' Grade by NAAC)
KARAIKUDI - 630 003 TAMILNADU

DIRECTORATE OF DISTANCE EDUCATION

M.B.A., (Tourism)



PAPER 4.2

TOURISM PROJECT MANAGEMENT

Printed at : **Hari Offset,** 139, Petit Canal Street, Pondy - 1 (April 2008 - Copies 1000)

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(IV Semester)



Paper-4.2

TOURISM PROJECT MANAGEMENT

Paper 4.2. TOURISM PROJECT MANAGEMENT

UNIT I

Pre – Investment Stage - I: Industrial background in India – government policies, guidelines and investment procedures- Identification of project opportunities – Capital budgeting.

UNIT II

Pre – Investment Stage - II: Preliminary feasibility study – Preparation of feasibility report

UNIT III

Project Evaluation and Appraisal: Facets of appraisal – Appraisal Criteria – Analysis of Project Risk – Preparation of model projects – Presentation

UNIT IV

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UNIT V

Project Control: PERT – CPM – Resource monitoring and control – Integrated resource management.

UNIT VI

Project Evaluation: Evaluation under uncertainty – Monitoring and MIS – Project audit – Project review and interface with industrial sickness.

Reference Books:

1. Gopalakrishnan and Ramamoorthy, V.E., Text book of Project Management, Macmillan India Ltd.,
2. Prasanna Chandra, Project Appraisal Management, Tata McGraw Hill
3. Ahuja, Project Management : Techniques in Planning and Controlling constructions Projects, Wiley
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UNIT I

PRE- INVESTMENT STAGE

Successful new business ventures and economic development and growth do not just happen. They are the result of right environment, planning, effort, and innovation. And this right mix can only be achieved by the entrepreneurs. Economic development goes beyond economic growth to include changes in output, distribution, and economic structure, which may affect such things as improvement in material well-being of the poor, technical breakthrough, increase in economic activities, and increases in the educational level and improvement in health. This could be effectively be materialized by adhering project approach in executing balanced regional economic growth interms of sector specific, area specific etc. Service industries are gaining momentum in the present day context. In the service sector one of the vital area is Tourism which directly concerns with people and natural environ of the country. It could attract lot of foreign exchange reserve and generate the GDP of the country in a invisible form. Besides, it could promote the image of the nation in the global scenario.

Tourism almost embraces all other sectors of the economy especially industrial sector very much. They are : Transport industry of all types, Construction industry, Hotel industry etc. To enrich the tourism sector effectively, project approach will contribute a lot. Hence, it is dare need to know about the project management approach and incorporate it for all practical purposes. This will tremendously increase the viability and industry and also ensure sustainable development of natural resources. This subject gives the learners a comprehensive picture about the Project management approach and its process and relevance etc in a lucid manner.

Industrialisation is widely recognised not only as one of the important means to user in socio-economic transformations and achieving industrial self-sufficiency but also for accelerated development of agriculture, transport, trade, services and other sectors through the forward and back ward linkages. It is a process which accelerates economic growth; effects structural changes in the economy, particularly in respect of resource utilisation, production functions, income generation, occupational pattern, population distribution and foreign trade; and induces social change. Jawaharlal Nehru had emphasized that "real

progress must ultimately depend on industrialization. Throughout the world, industrialization has indeed become the magic word of mid-twentieth century".

Industrialization is brought about by the teeming entrepreneurs. Entrepreneurship is one of the most important factors if industrialization. Entrepreneur is a kingpin in the process of economic growth.

The impressive growth profile of the tourism sector observed over the last decade appears to be continuing. As per the world tourism organization, about 763 million tourists traveled internationally in 2004 and spent about US $ 622 billion. As per the estimate, tourism accounts for 12.2 % of total world exports and 8.1 % of global employment. Indian tourism industry registered a growth of 24% in terms of foreign tourists arrivals and foreign exchange grew at the rate of 26.4% in the year 2004.

Improvement of airports, passenger amenities and emphasis on targeted tourist segments need to be vigorously pursued to ensure further sustained boost in the tourism sector. This requires evolving concrete strategies and improving tourism related information and infrastructure with the help of adopting project approach.

Project Approach

Rapid industrialization calls for investing resources which can be analyzed and apprised reasonably independently. In this sense, project is important component of economic development.

The study is concerned primarily with preparation, appraisal, and implementation of investment projects. Although, the objective of investment decision is maximization of the market value of equity, it becomes secondary when a project is being evaluated from the lager social point of view.

The study of project management acquires greater importance in accelerating the process of industrialization in particular and the economy in general.

To ensure that the project is implemented and completed successfully, there are certain pre-project and post project activities which have to be carried out with great care. Whereas the pre project activities are necessary for smooth implementation of the project in minimum time and cost, the post project activities are necessary for optimum production of desired quality product.

It is practice, in India, to compare the entire period (including pre-and post-project phases) for projects in India, with only the erection phase of similar projects implemented in western and Japan. This, however, is realistic and unjust and results in frustration to the project execution team.

We should not ignore the preparation and crystallizing process upto finalizing the last details and the time and resources that are spent by these countries before the project implementation could be physically seen. For proper implementation of project, the pre-project and post-project activities must be given sufficient importance and time due to them.

Every project has to go through the following stages:

- Conceptualizing.
- Market survey, feasibility study and expansion plans giving final picture.
- Focusing with respect to quality, capacity or product mix with capacities.
- Site selection, taking into account availability of raw materials, infrastructural facilities, finished goods market location or area targeted, and a balance amongst these.
- Basic engineering and extended basic engineering considering local conditions.
- Detailed engineering and statutory documentation preparation for required approvals from various bodies, safety and security.
- Procurement, transportation and insurance etc.
- Erection and pre commissioning activities.
- Commissioning.
- Performance trails and commercial production.
- Pre-project activities start with site selection. These activities could be broadly enlisted as:

- Ascertaining applicable statutory requirements, documentation and includes applying for water and electricity required for construction activities
- Land procurement and site development.
- Land survey, soil investigation and deciding type of foundations for equipments and buildings.
- Establishing types and sizes of building for main plant or production unit. Recovery unit, buildings for utilities, warehouses, tank farms for raw materials and finished goods, etc.
- Preparation of the master plan showing future expansion in phased manner considering directional or location norms suggested by vastu shastra, in case the owner/management desires.
- Freezing the plot plan for the present phase of the project.
- Freezing roads, drains and areas of contractors for construction activities and labour camps.

It is advisable to prepare a number of alternative master plans, taking into consideration the expansions in the production, utilities, administrative buildings, including, canteen and toilets. Even roads, rain water and process drains sewage lines, water storage facilities should be planned so as to be located or expanded with minimum cost, operations and maintenance ease.

PROJECT MANAGEMENT

Project management is an existing new profession which receives much attention in these days. It is concerned with the management of resources successfully to complete the project, the resources being time, money, materials and equipment and the most expensive resource of all - namely the human resource.

Project management is concerned with achieving a specific goal in a given time using resources available for that period only.

Project management can mean different things to different people. Project management as regards ongoing projects within a company refers the art of

creating the illusion that any outcome is the result of a series of predetermined, deliberate acts when, in fact, it was dumb luck. It is designed to make better use of existing resources by getting work to flow horizontally as well as, vertically within a company.

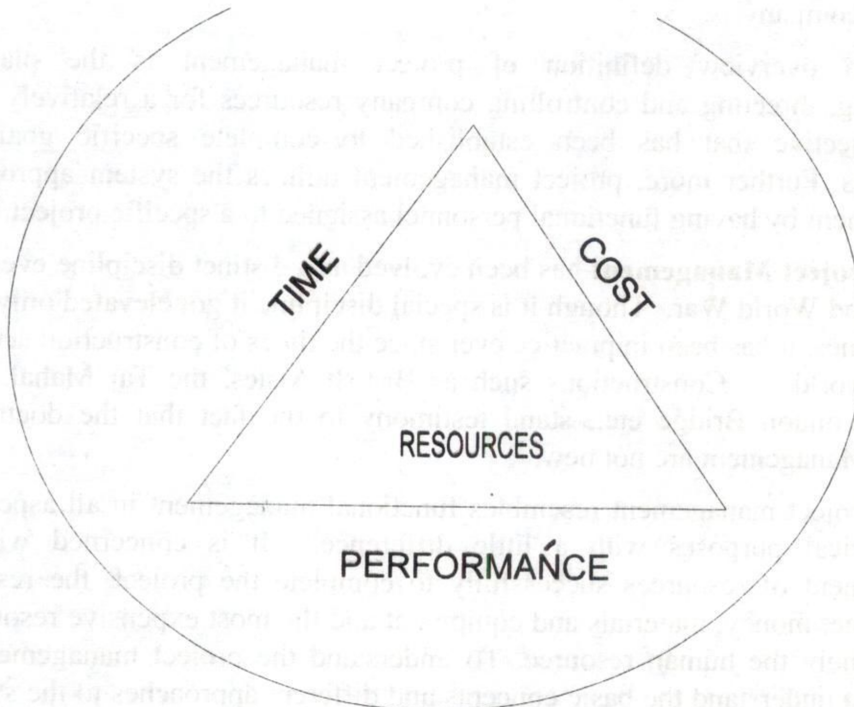
An overview definition of project management is the planning, organising, directing and controlling company resources for a relatively short-term objective that has been established to complete specific goals and objectives. Further more, project management utilizes the system approach to management by having functional personnel assigned to a specific project.

Project Management has been evolved as a distinct discipline ever since the Second World War. Though it is special discipline it got elevated only in the recent times, it has been in practice ever since the times of construction activities in this world. Constructions such as British Aisles, the Taj Mahal, Eiffel Tower, London Bridge etc., stand testimony to the fact that the doctrine of Project Management are not new.

Project management resembles functional management in all aspects for all practical purposes with a little difference. It is concerned with the management of resources successfully to complete the project, the resources being time, money, materials and equipment and the most expensive resource of all - namely the human resource. To understand the project management one must first understand the basic concepts and different approaches to the study of management. An overview of different management approaches with specific emphasis on System approach to management and its relevance to project management, brief mention about the steps in project management, benefits and limitation of project management, and also an outline about effective project management are discussed in this lesson.

Thus, the project management is designed to manage or control company resources on a given activity, within time, within cost and within performance. This has been depicted in the following diagram.

GOOD CUSTOMER RELATIONS



Project management involves project planning and project monitoring and includes such item as

- ❖ Project planning.
- ❖ Definition of work requirements.
- ❖ Definition of quantity of work.
- ❖ Definition of resources needed.
- ❖ Project monitoring.
- ❖ Tracking progress, comparing actual to predicted.
- ❖ Analysing impact and making adjustments.

Thus, the successful project management can be defined as the process of achieving the project objectives within the cost (budget), at the desired performance and within the allocated time.

STEPS IN PROJECT MANAGEMENT

Project Management basically consist of the following five steps.

Grouping work into packages which acquires the properties of a project. This means that the works so grouped are related to each other, contribute to the same goals and can be bound by definite time, cost and performance targets.

Entrusting the whole project to a single responsibility centre known as the project manager, for coordinating directing and controlling the project.

Supporting and servicing the project internally within the organisation by matrixing or through total projectisation, and

Building up commitment through negotiations, coordinating and directing towards goals through schedules, budgets and contracts.

Ensuring adherence through negotiations, coordinating and directing towards goals through schedules, budgets and contracts.

Defining what is to be done, maintaining its integrity and ensuring that it is done and performed as desired, within time and cost budgets fixed for it through a modular work approach, using organisational and extra-organisational resources is what is project management.

BENEFITS OF PROJECT MANAGEMENT

Project Management helps to avail the following benefits:

- Identification of functional responsibilities to ensure that all activities are accounted for regardless of personnel turnover.
- Minimising the need for continuous reporting.
- Identification of time limits for scheduling.
- Identification of a methodology for trade-off analysis.
- Measurement of accomplishment against plans.

- Early identification of problems so that corrective action may follow.
- Improved estimating capability for future planning.
- Knowing when objectives cannot be met or will be exceeded.

OBSTACLES IN PROJECT MANAGEMENT

To enjoy the various benefits of project management given above, the following obstacles should be overcome carefully.

- Project complexities
- Execution of customer's special requirements
- Organisation restructuring is a typical task
- Project risks
- Changes in technology
- Forward planning and pricing.

PROJECT MANAGEMENT – A PROFESSION

Project management has been evolved as a distinct ever since the Second World War. It has got elevation the recent times.

Novelty is the hallmark of every project, hence it should exhibit fascination and dynamism. This requires professional approach in conceiving, implementing and controlling projects. Though the functional management and project management are related, the degree of professional approach is highly essential for the efficient management of project. The project management is mainly driven by intellectual operation and skilled and mechanical operations. Project management is covered by the matrix form of organisation structure where a roles are defined according to a combination rather than functional specialisation.

Only manages with sufficient spirit and dynamism can withstand the overwhelming dizziness in these incessant operations.

Hence, the project management requires sound expertise and exposure, which may not be possessed by the project promoter. So they have to resort the assistance from projects consultants and project managers. A brief description

about the role of project manager and need functions of project consultants are given below.

PROJECT IDENTIFICATION

Introduction

An entrepreneur has an infinitely wide choice with respect to his project in different dimensions such as product/service, market, technology, equipment, scale of production, time phasing and location. Hence, the identification of investment opportunities (projects) calls for understanding the environment in which one operates, sensitivity to emerging investment possibilities, imaginative analysis of a variety of factors and also chance of luck. This chapter is concerned with the scouting and screening of project ideas, steps in the project identification process and also consideration involved in identifying the new projects by an existing company.

PROJECT IDEAS

It is the first and foremost task of an entrepreneur to find out suitable business which is feasible and promising and which merit further examination and appraisal. Therefore, he has to first search for a sound of workable business idea and give a practical shape to his idea. while doing so, the entrepreneur has to tackle the various problems from time to time to achieve the ultimate success. Since the good project ideas are elusive, a variety of sources should be tapped to stimulate the generation of project ideas.

SOURCES OF PROJECT IDEAS

Project ideas could originate from the various sources viz.,

Success story of a friend/relatives

Experience of others in manufacture/sale of product

Examining the inputs and outputs of industries

Plan outlays and government guidelines

Suggestions of financial institutions and developmental agencies

Investigation of local materials and resources

Economic and social trend of the economy

New technological developments

Project profiles and industrial potential surveys

Visits to trade fairs

Unfulfilled psychological needs

Possibility of reviving sick units

The various sources from which the project idea can be generated are explained below:

Analyse the performance of existing industries

A study of existing industries in terms of their profitability and capacity utilisation is helpful. The analysis of profitability and break even level of various industries indicates promising investment opportunities. Opportunities which are profitable and relatively risk free. An examination of capacity utilisation of various industries provides information about the potential for further investment. Such a study becomes more useful if it is done regionwise, particularly for products which have high transportation costs.

Examine the inputs and outputs of industries

An analysis of the inputs required for various industries may throw up project ideas. Opportunities exist when (i) materials purchased parts, or supplies are presently being procured from different sources with attendant time lag and transportation costs and (ii) several firms produce internally some components/ parts which can be supplied at a lower cost by a single manufactures who can enjoy economies of scale.

A study of the output structure of existing industries may reveal opportunities for further processing of output or even processing of waste.

Examine imports and exports

An analysis of import statistics for a period of five to seven years is helpful in understanding the trend of imports of various goods and the potential for import substitution. Indigenous manufacture of goods currently imported is advantageous for several reasons:

it improves the balance of payments situation
it provides market for supporting industries and services
it generates employment

Likewise, an examination of export statistics is useful in learning about the export possibilities of various products.

Plan outlays and government guidelines

The government plays a very important role in our economy. Its proposed outlays in different sector provides useful pointers toward investment opportunities. They indicate the potential demand for goods and service required by different sectors.

Suggestions of financial institutions and developmental agencies:

In a bid to promote development of industries in their respective states, state financial corporations state industrial development corporations and other developmental bodies conduct studies, prepare feasibility reports and offer suggestions to potential entrepreneur. The suggestions of these bodies are helpful in identifying promising projects.

Investigate local materials and resources

A search for project ideas may begin with an investigation into local resources and skills, various ways of adding value to locally available materials may be examined. Similarly, the skills of local artisans may suggest products that may be profitably produced and marketed.

Analyse economic and social trends

A study of economic and social trends is helpful in projecting demand for various goods and services. Changing economic conditions provide new business opportunities. A great awareness of the value of time is dawning on the public. Hence the demand for time saving products like prepared food items, ovens and powered vehicles has been increasing. Another change that we are witnessing is that the desire for leisure and recreational activities has been increasing. This has caused a growth in the market for recreational products and services.

Explore the possibility of reviving sick units

Industrial sickness is rampant in the country. There are over 20,000 units which have been characterised as sick. These units are either closed or face the prospect of closure. A significant proportion of sick units, however, can be nursed back to health by sound management, infusion of further capital and

provision of complementary inputs. Hence there is a fairly good scope for investment in this area. Such investments typically have a shorter gestation period because one does not have to begin from scratch. Indeed, in many cases, marginal efforts would suffice to revive such units.

Identify unfulfilled psychological needs

For well established, multi brand product groups like bathing soaps, detergents, cosmetics and tooth pastes, the question to be asked is not whether there is an opportunity to manufacture something to satisfy an actual physical need but whether there are certain psychological needs of consumers which are presently unfulfilled. To find whether such an opportunity exists, the technique of spectrum analysis may be followed. This analysis is done somewhat as follows. i) Important factors influencing brand choice are identified (ii) respect of the factors identified in step (iii) gaps which exist in relation to consumer psychological needs are identified.

Visit to trade fairs

Attending the National and International trade fairs provides an excellent opportunity to know about new products and new development.

The above said sources of project ideas may be generated by the Government agencies, credit institutions, non governmental organisations and also by public.

The Govt. have largest resources and have the necessary information to generate project ideas and it plays a predominant role in this sphere. The government has the required facilities and manpower to conduct detailed studies which may lead to making investment decisions. Banks and other financial institutions are actively involved in sharing the social responsibility of achieving the national objectives of economic development. The co-operatives and non governmental organisations as well as individual entrepreneurs are now actively participated in identification of projects. The awareness of involving the people or the beneficiaries in project identification is now increasing fast. Since the local people have the first hand knowledge of the potentials and problems of the area to which they belong, more realistic project identification has become possible with their involvement. It needs no emphasis the project ideas would be generated in better manner both in the qualitative as well as quantitative terms

when the knowledge and ideas of the Govt. functionaries, people, the financial institutions and other experts are pooled together.

PURPOSE AND NEED FOR PROJECT IDENTIFICATION

The entire economic management planning is based on two fundamental assumptions. i.e. a) limited means and b) unlimited ends. A planner has to select few important needs to cut it into size of his/her means. This may be treated as fixing the priority is called identification of project. It helps in elimination process. Identification and selection of a project is a scientific process. This process is based on certain essential conditions. It may differ from project to project. The essential conditions which should be taken into consideration for identification and selection of production projects are as follows:

i Project should be in conformity with the economic needs of the area.

ii It should take into account the depriving factors which might have adverse impact.

iii The input-output ratio should be optimum.

iv The purpose of the project is to increase the production and employment of the area.

Thus, the above said conditions will differ due to resources availability, use pattern and other relevant conditions of the area. Besides that, project should also consider certain national priorities.

STEPS IN PROJECT IDENTIFICATION

Project ideas are like other ideas which don't take concrete shape immediately. There are several stages of making propositions their considerations and scrutiny for their soundness.

An idea is first born, it is under incubation for sometime and subsequently it begins to take some definite shape. The project ideas to develop take almost the same course. This project identification may be broadly divided into four stages, viz.,

A. Conceptual stage - where project ideas are generated

B. Screening stage - at which unviable ideas are eliminated

C. Identification stage - at which viable projects are selected

D. Pre-feasibility state - at which pre-feasibility studies are taking up.

Conceptual stage

A number of project ideas may be generated either by those officials or non-officials and entrepreneurs individually or collectively who are conversant with the area. In this context, one has to examine the potentialities of development and the problems, needs and aspirations of the people of the concerned area.

Screening stage

In the second stage project ideas generated above are screened in a preliminary exercise to weed out the bad or unviable ideas. All project ideas would not pass the screening test. Some project ideas may be imaginary to warrant any serious consideration.

The third & fourth stages may be called as investment opportunity study. This study is necessarily preliminary and the broad one and has a limited objective of providing planners with a choice of projects from which they can make a selection. Pre-feasibility study is an intermediate stage between an investment opportunity study and a detailed feasibility study and these can be differentiated mainly on the basis of information required for respective stages.

SCREENING OF PROJECT IDEAS

After gathering the project ideas from the various sources as aforesaid, it is essential to eliminate ideas which prima facie are not promising. This process of eliminating the irrelevant and unviable ideas is called screening of project ideas. It can be done with the help of testing the following conditions of the propositions.

a. Compatibility with the promoter

b. Consistency with governmental priorities

c. Availability of inputs

d. Adequacy of market

e. Reasonableness of cost

f. Acceptability of risk level etc.

The project idea must be compatible with interest personality and resources of the entrepreneur. It should be accessible to him and also it offers him the prospects of rapid growth and high return on invested capital.

The project idea must satisfy or go along with the governmental priorities, National goals and governmental regulatory framework.

e.g. No contrary environmental effects to governmental regulations

Easily accommodating foreign exchange requirements

No difficulty in obtaining license.

The resources and inputs required for the project must be reasonably assured. This feature of the project can be assessed with the help of determining the following points relating to a project.

Capital requirement within manageable limit

Obtaining technical know-how

Availability of raw materials at a reasonable cost

Obtaining power supply

Identifying the adequacy of market is the key factor to select, the viable project idea. To judge the adequacy of market the following factors have to be examined.

Total present domestic market

Competitors and their market shares

Export market

Quality price profile of the product

Sale and distribution system

Projected increase in consumption

Barriers to the entry of new units

Economic social and demographic trends favourable to increased consumption

Patent protection

Reasonableness of cost is another factor to screen the project ideas. The cost structure of the proposed project must enable it to realise an acceptable profit with a competitive price. The following cost factors must be carefully considered to design a viable cost structure.

Cost of material inputs, labour costs, factory overheads.

General administration expenses, selling and distribution costs.

Service costs, economics of scale etc.

Acceptability of risk level is another factor which helps to screen the project ideas and hence determine the desirability of a project.

METHODOLOGY FOR PROJECT IDENTIFICATION

To make a viable project it should be linked with the actual circumstances prevailing in the area. Without knowing the basic information relating to socio-economic conditions of the area, it is difficult to draw a suitable project for the area. Development needs and potentials vary from area to area. For specific area, before drawing a project, local condition and other relevant factors must be taken into consideration. Most of the project fail because they were not based on local problems. Assumptions based on macro level information may fail to watch at micro level. Survey is a technique to unearth the hidden information which are vital to identify the basic requisites of project i.e. need, resources and priorities. It also helps in making right choice between different alternatives. Secondly it presents lot of information to be used as bench mark information which will help at the later stage for evaluation of the project.

PROJECT IDENTIFICATION FOR AN EXISTING COMPANY

Existing companies essentially large scale company form of organisations are continuously developing various projects for their developmental purposes. While doing so, the existing company has to make a more intensive analysis of its resources and environment and conceive of projects on the basis of its existing activities. An existing company which seeks to identify new project opportunities should undertake a "SWOT" analysis. It is an acronym law of strengths and weaknesses and opportunities and threats. This analysis evaluate all these four characteristics of existing company.

A brief summary of the points required for SWOT analysis is given below:

* Availability of internal financial reasons for new projects after taking into account the need for replacement expenditure, increase in working capital, repayment of borrowings and dividend payments.
* Capability of raising external financial resources.
* Availability of production facilities.
* Technological capabilities of the company.
* Availability of different sources of raw materials and its utilisation.
* Availability of infrastructural facilities.
* Cost structure and profit margins of the company.
* Distribution network of the company
* Market share of the company.
* Capability of top management of the company.
* State of industrial relations in the company.
* Impact of corporate laws on the growth of the company especially (MRTP ACT) etc.,
* Likely changes in the governmental policies.
* Possibility of evolving new technology and its impact on the cost structure of the company.
* Existence and severity of competition.
* Changes in the customers preferences, tastes etc.

By considering the above said information keenly the SWOT analysis helps to provide the basis for the corporate strategy to be followed and indicate the major areas of thrust. These may include expansion of the capacity of existing product range, vertical integration, diversification in related areas and mergers.

Summary

Thus this lesson has explained to you the significance and mode of conceiving a good project idea. It also explains to you the various sources from

which the project ideas can be generated and how one should select the project idea.

SELF ASSESSMENT QUESTIONS

1. Explain the significance of project approach for the economic development of the country.
2. Give an outline about the project opportunities available in different sectors of the economy.
3. Describe the various resource potentials of our country.
4. Explain the latest trend in the infra-structural projects in India.
5. Give a brief note about the various on-going social-welfare sector projects.
6. What factors would you take into account for identifying promising investment opportunities?
7. What is SWOT analysis and how it can be done?
8. Explain the process of project identification.

* * *

UNIT-II

FEASIBILITY ANALYSIS

Feasibility analysis is the first stage in the process of project development. The purpose of the analysis is to examine the desirability of investing in pre-investment studies. For this purpose it is essential to examine project idea in the light of the available internal (inputs, resources & outputs) and external constraints (environment). When a project idea is taken up for developmental three situations can arise. The project may appear to be feasible, project idea is taken up for development three situations can arise. The project may appear to be feasible, project may turn out to be not feasible or the available data may not be adequate for arriving at reasonable decision regarding further investment. In the last mentioned case, investment in pre-investment studies will obviously have to be deferred till such time as adequate data regarding the project feasibility is available. The project sponsoring body will therefore have to invest in collecting additional data and refer the investment decision for the time being. In the second situation when the project is found to be not feasible, further investment in the project idea is completely ruled out. In the third situation, when the project idea is found to be feasible, the decision-makers can proceed to invest further resources in pre-investment studies and design development.

NATURE OF PROJECT FEASIBILITY ANALYSIS

In the broadest sense, every rational decision to make new investment is proceeded by an investigation of the feasibility of the project, whether or not this carried out in a formal manner. The larger the project and greater the investment, the more formalised the investigation. Assurance is needed that the market exists or can be developed, that raw materials can be obtained, that sufficient labour supply is available, that local services vital to the project are at hand, and that the overall costs for plant equipment, labour and raw material inputs will be of a certain order. Most importantly it must be determined that income will exceed costs by a margin sufficient to make the project financially attractive. When the project is small, the study format may be quite informal, perhaps there will be no formal study at all and little accumulation of actual data. Nevertheless, the

feasibility calculations will have to be computed and evaluated, even if an informal manner before the ultimate step of actual investment is taken.

NEED FOR FEASIBILITY STUDIES

A company is incorporated for the purpose of setting up a project. The promoters obviously have, to start with, some broad idea about the proposed industrial activity. They make mental picture as to how the idea, when translated into reality would result in a profitable project, given the demand supply pattern, probable cost of production etc. It is quite likely that the originators get attracted by the favourable aspects of the project known to them, while they may have overlooked the dark side of the picture, which can only be revealed by a detailed objective study. Too many projects have floundered, at considerable loss to the investors and indeed to the national economy through waste of scarce resources, because the investment decisions were taken without objective and in depth techno-economic feasibility studies. The need for such careful studies is further underscored on two counts:

1. In modern times, business operations are complex, requiring carefully prepared plans.
2. The shareholders, creditors, term leaders etc. insist on as complete an analysis of the scheme as possible without their co-operation, it would not be possible to translate the idea into action.

This feasibility study helps the promoter to make the investment decisions correctly and to obtain funds without much difficulties.

It allows the promoters to anticipate the problems likely to be encountered in the execution of the project and phases them in a better position to answer the queries that may be raised by the financial institutions and others who would have to be involved in the project.

COMPONENTS OF FEASIBILITY STUDY

Project feasibility study comprises of market analysis, technical analysis, financial analysis, and social profitability analysis. The analysis is mainly interested only in the commercial profitability and thus examining only the

market, technical and financial aspects of the project. But, generally the gamut of feasibility of a project covers the following areas.

1. Commercial and economic feasibility
2. Technical feasibility
3. Financial feasibility
4. Managerial feasibility
5. Social feasibility or acceptability

These areas are briefly described below.

COMMERCIAL AND ECONOMIC FEASIBILITY

The economic feasibility aspect of a project relates to the earning capacity of the project. Earnings of the project depends on the volume of sales. If taken into consideration the following important indicators.

* Present demand of the goods produced through the project. i.e. market facility (or) getting a feel of the market.

- Future demand: a projection may be made about the future demand. The period normally depend upon the scale of investment.
- Determining the extent of supply to meet the expected demand and arriving at the gap.
- Deciding in what way the project under consideration will have a reasonable chance to share the market.
- Anticipated rate of return on investment. If it is positive the project justifies the economic norm in the relationship between cost and demand.

Future demand can be estimated after failing into consideration the potentialities of the export market, the charges in the income and prices, the multiples use of the product, the probable expansion of industries and the growth of new industries. The share of the proposed project in the market could be identified by considering the factors affecting the supply position such as competitive position of the unit, existing and potential competitors, the extent of

capacity utilisation, units costs advantages and disadvantages, structural changes and technological innovations bringing substitute into the market.

The commercial feasibility of a project involves a study of the proposed arrangements for the purchase of raw materials and sale of finished products etc. This study comprises the following two aspects.

Arriving at the physical requirement of production input such as raw materials, power, labour etc., at various level of output and converting them into cost. In other words, deciding costing pattern.

Matching costs with revenues with a view to estimating the profitability of the project and the break-even point. The possibility ultimately decides whether the project will be a feasible proposition.

The technical analysis of a project feasibility study serves to establish whether or not the project is technically feasible and it also provides a basis for cost estimating.

TECHNICAL FEASIBILITY

The examination of this aspect requires a thorough assessment of the various requirements of the actual production process and includes a detailed estimate of the goods and services needed for the project. So, the feasibility report should give a description of the project in terms of technology to be used, requirement of equipment, labour and other inputs. Location of the project should be given special attention in relevance to technical feasibility. Another important feature of technical feasibility relates the types of technology to be adopted for the project. The exercise of technical feasibility is not done in isolation. The scheme has also to be viewed from economic considerations; otherwise, it may not be a practical proportion however sound technically it may be.

The promoters of the project can approach the problem of preparation of technical feasibility studies in the following order:

* Undertaking a preliminary study of technical requirements to have a quick evaluation.
* If preliminary investigation indicate favourable prospects working out further details of the project. The exercise begins with engineering and

technical specifications and covers the requirements of the proposed project as to quality, quantity and specification type of components of plant & machinery, accessories, raw materials, labour, fuel, power, water, effluent disposal transportation etc.

Thus, the technical feasibility analysis is an attempt to study the project basically from a technician's angle. The main aspects to be considered under this study are: technology of the project, size of the plant, location of the project, pollution caused by the project production capacity of the project, strength of the project. Emergency or stand-by facilities required by the project sophistication such as automation, mechanical handling etc. required collaboration agreements, production inputs and implementation of the project.

FINANCIAL FEASIBILITY

The main objective of this feasibility study is to assess the financial viability of the project. Here, the main emphasis is in the preparation of financial statement, so that the project can be evaluated in terms of various measures of commercial profitability and the magnitude of financing required can be determined. The decision about the financial feasibility of a project should be arrived at based on the following consideration:

For existing companies, audited financial statements such as balance sheets, income statements and cash flow statements.

For projects that involve new companies, statements of total project cost, initial capital requirements, and cash flow relative to the projective time table.

Financial projections for future time periods, including income statements, cash flows and balance sheets.

Supporting schedules for financial projections stating assumptions used as to collection period of sales, inventory levels, payment period of purchases and expenses and elements of production cost, selling administrative and financial expenses.

Financial analysis showing return on investment return on equity, break-even volume and price analysis.

If necessary sensibility analysis to identify items that have a large impact on profitability or possibly a risk analysis.

MANAGERIAL FEASIBILITY

The success or failure of a project largely depends upon the ability of the project holder to manage the project. Project is a bundle of activities and each activity has its own role. For the success of a project, a project holder has to co-ordinate all the activities in such a way that the additive impact of different inputs can produce the desired result. The ability to manage and organise all such inter related activities come within the concept of management. If the person incharge of the project, has the ability, has the ability to manage all such activities, the desired result can be anticipated.

There are three ways to measure the managerial efficiency.

a. Heredity skill

b. Skill acquired through training.

c. Skill acquired in course of work.

SOCIAL FEASIBILITY

A project may cross all the above barriers mentioned above an found very suitable but it will lose its entire creditability, if it has no social acceptance. Though the social customs, conventions such as caste community, regional influence etc. are creating hindrance for development of a project should avoid all such social conflicts which will stand on the successful implementation of the project.

(e.g) Considering the interests of the general public; projects which offer large employment potential, which channelise the income from less developed areas will stimulate small industries.

In a nut shell, the feasibility report should highlight on these five testing stones before it can be declared as complete and only after judging through these indicators a project can be declared as viable and can be submitted for finance or any other assistance from any institutions.

FEASIBILITY REPORT

A feasibility report is an investment proposal base on certain information and factual data appraising the project. This type of feasibility study may be required by the financing institutions, project sponsor, project owner. The feasibility report enables the project holder to know the inputs required and if rightly prepared confirms to the convictions that he is proceeding in the right direction. In other words, a project needs to be fully defined in order to provide terms of reference for the management of the project.

A project can be considered to have been fully established when the following conditions are fulfilled.

The technical configuration of the project has been fully defined.

The performance requirement for the various technical system and the key equipment have been specified.

Cost estimate for the project is frozen.

Techno-economic viability of the project has been examined, appraised and approved.

An overall schedule for implementation of the project has been drawn-up.

The feasibility report is prepared during the definition phase of a project. It lies in between project formulation stage and appraisal and sanction stage. It is prepared to present an in-depth techno-commercial analysis carried out on the project idea for consideration of the financial institutions and other authorities empowered to take the investment decision.

FORMAT OF FEASIBILITY REPORT

The sketch of feasibility report of project is given below:

1. Introduction
2. Summary and Recommendations
3. Product Capacity, Chemistry of the product, specifications, properties, application and uses.
4. Market potential

5. Process and know-how
6. Plant and machinery
7. Location of the unit
8. Plot plan and building
9. Raw materials availability
10. Utilities, requirements
11. Effluents treatment
12. Personnel requirement
13. Capital cost
14. Working capital
15. Mode of finance
16. Manufacturing cost
17. Financial analysis
18. Implementation schedule

CHECK LIST FOR FEASIBILITY REPORT

The following key elements must be presented in the feasibility report.

1. Examination of public policy with respect to the industry project
2. Broad specification of outputs and alternative techniques of production.
3. Listing and description of alternative locations
4. Preliminary estimates of sales revenue, capital costs and operating costs of different alternatives.
5. Preliminary analysis of profitability for different alternatives.
6. Marketing analysis
7. Specification of product pattern and product price
8. Raw material investigation and specification of sources of raw material supply.

9. Estimation of material energy, flow balance and input prices.
10. Listing of major equipment by type, size and cost.
11. Listing of auxiliary equipment by type, size and cost.
12. Specification of sources of supply for equipment and process know-how.
13. Specification of site and completion of necessary investigation.
14. Listing of buildings, structures and yard facilities by type size and cost.
15. Specification of supply sources connection costs and other costs for transportation services, water supply and power
16. Preparation of layout.
17. Specification of skill-wise labour requirements and labour costs.
18. Estimation of working capital requirements
19. Phasing of activities, and expenditure during construction
20. Analysis of profitability
21. Determination of measures of combating environmental problems
22. State the preparedness to implement the project rapidly.

CONCLUSION

Thus the process of project formulation involves a stage by stage development of the project idea into an investment proposition. The conclusion drawn at the end of each stage form the basis of development of the ensuing stage. These conclusions also provide necessary materials for re-checking of the initial premises from which a beginning was made. There must be forward and backward look at the completion of every stage. So, the project formulation team has to be ready to revise its opinions and conclusions in the light of further evidence.

It also narrates the very purpose of a feasibility report in a lucid manner, covering components of feasibility reports, principal features of project feasibility study and also checklist for feasibility study. It helps in defining and analysing the alternative approaches to production processes and outcomes. It focuses attention on the material inputs and various other techno-economic

variables. It describes the optimisation process, justifies the assumptions and hypothesis set thereby selecting the better alternative solutions and defines the clear boundaries of a project viability.

Review Questions

1. What do you mean by feasibility study? Explain its significance in project formulation?
2. Explain the different components of feasibility study.
3. Suggest a suitable outline of feasibility report for setting up a small scale industry.
4. How a technical feasibility of a project can be ascertained?
5. Analyse the significance of managerial competence and commercial viability of project in the feasibility study.
6. What the elements to be covered in the feasibility report?

* * *

UNIT III

PROJECT EVALUATION AND APPRAISAL

Introduction

The exercise of project appraisal simply means the assessment of a project in terms of its economic, social and financial viability. This exercise basically aimed at determining the viability of a project and sometimes also in reshaping the project so as to upgrade its viability i.e. it aims at sizing up the quality of projects and their long-term profitability.

Appraisal of term loan proposals (projects) is an important exercise for the financial institutions and investing companies in credit decisions. The art of project appraisal puts more emphasis on the economic and technical soundness of the project and its earning potential than on the adequacy and liquidity of the security offered. Hence, the process of appraisal should require more dynamic approach as it is linked with a sense of uncertainty.

APPRAISAL PROCESS

Project appraisal is a scientific tool. It follows specific pattern. This process usually involves six areas of appraisal such as market appraisal , technical appraisal, financial appraisal, profitability appraisal, managerial, and social appraisal.

MARKET AND DEMAND APPRAISAL

Appraisal of commercial viability means assessment of marketability of the end-product. Therefore, at the time of assessment of commercial viability, the following points require careful consideration.

- Size and prospective growth of the market which the unit is required to cater like nature of population, their purchasing power, their educational background, fashion etc.
- Demand and supply position of the product in the national and international market
- Nature of competition
- Pricing policy including prospective prices vis-a-vis the quality of the product

- Marketing strategy and selling arrangements made by the unit adequacy of sales force.
- Export potential
- If the product is an important-substitute, the position regarding existing imports in the country along with the C.I.F value of the imported goods, vis-a-vis cost of product of the unit.

TECHNICAL APPRAISAL

A project is considered to be technically feasible, if it is found to be 'sound' from technical and engineering point of view. It is an attempt to find out how well the technical requirements of the unit can be met, which location would be most suitable and what the size of plant and machinery should be.

Objectives of technological appraisal

The fundamental objective of appraising a project from the technology point of view is to justify the present choice and provide an insight into future technological developments. Other objectives are:

- to justify the goal compatibility of a project with the preferred technology;
- to seek a better available alternative technology which is both cost effective and efficiently manageable;
- to seek such a technology that can go with existing skill levels of team members or requires little orientation and training programmes;
- to seek a better technology that is not detrimental to the overall environment.

The technology that is used in projects can be classified on the basis of:

- Purpose for which it is applied;
- Level at which it is used;

Nature of skills applied while using the technology. On the basis of purpose, the technology can be:

Manufacturing technology which is generally used in manufacturing industries like textiles industries like textile industries, steel industries, etc.,

Extraction technology which is used in extraction of basic raw materials such as oils, petroleum products, coal and pig iron, etc.,

Conversion technology which is used in process industries like cement, sugar, etc.

Pre-fabricated technology which is used in construction industries like roads, bridges, and buildings, sheds etc., On the basis of the level at which technology is used the classification is as follows:

Core technology which is a base for any industrial activity like basic plant and machinery that is erected. For example, Lakshmi Machine works textile machine installed in a textile firm.

Engineering and design technology which supports the core technology by providing basic layouts and helps in erecting the plant at the required site. Considering the above example, the machine has to be linked with essential spindless and spools through which the yarn is supplied to the machine on which the yarn will be warped and weft.

Intermediate technology which supports both core technology and engineering and design program with sufficient intermediaries such as heavy machine tools and devices to mobilize input and output and output of firm and continue to operate the machinery.

Component technology which is labelled as supplied or consumable for the core, engineering and even intermediate technology. For example, spare parts of a machine, screws lubricating oil, belts, electrical connections and other engineering fittings, etc.,

Essentials of technological appraisal

While performing a technological appraisal some of the vital ingredients that need attention are:

- the state of existing and available technology
- training needs of personnel for the present technology and for the new technology;
- availability of technical know-how;
- input base for the technology or its compatibility with the input substitutes;

- future progressive integration of the technology for modifications or refinements;
- wider product-mix and its by-products;
- minimization of waste, loss or scrap in the process or its development;
- factor intensity
- stability to changes and its relative obsolescence rate;
- other techno-economic considerations (side effects of technology transfers on the labour lay-off, etc)

Generally, while appraising technical feasibility of any project, the following points are carefully considered.

1. Availability of critical inputs

The critical inputs mean all the basic location and operational requirements which make the project viable. These include:

- Raw materials. For instance, sugar factories are situated near sugarcane producing areas.
- Availability of land.
- Nearness to market for finished product. The units producing heavy bulk finished goods are always situated near the regional market.
- Availability of essential utilities like water, power and fuel.
- Availability of skilled/unskilled labour in the proximity.
- Facility for disposal of effluents.
- Availability of suitable technical and administrative personnel.
- Adequacy of arrangements for pollution control and for environmental protection.

2. The capacity of the plant and manufacturing process and suitability of the technology employed.

These call for careful consideration regarding choosing right size of the plant, proper layout and correct technical design. The capacity of the plant should be neither too low rendering it uneconomic nor too high to keep it idle.

This has assumed tremendous importance especially in view of the fact that Indian industry has a tendency to have cost and high capital output ratio.

3. Plant and Machinery

In this regard careful consideration should be given to the following aspects.

- Suitability of plant and machinery for the manufacturing process to be adopted:
- Name and reputation of the supplier of plant and machinery:
- Their availability in time so as to avoid any time and cost overrun:
- Reasonableness of their cost:
- Provision for performance guarantee and after sale service by the suppliers.

4. Project planning and scheduling

Planning should be pragmatic and proper so that the construction and gestation period are estimated properly and there are no time and cost over-run. Of late, many of the projects have failed because of faulty planning at the initial stage and subsequent delay in sanction/release of more funds by banks/financial institutions. Generally, the CPM techniques are used for net-work scheduling.

The various points one has to take into consideration while estimating time are:

- Industrial license
- permission for collaboration arrangement and the present position regarding signing of the same
- Consent of the appropriate authority for disposal of effluents
  - ⇒ SEBI's consent for issue of capital, if applicable
  - ⇒ Import license for plant and machinery and raw materials
  - ⇒ Tying up of credit facilities from financial institutions/banks
  - ⇒ Possible timing of issue of capital including underwriting arrangement for the same

⇒ Acquisition of land

⇒ Soil testing

⇒ Construction (Civil and Architectural)

⇒ Supply of plant and machinery including installation thereof

⇒ Recruitment of manpower

⇒ Supply of raw materials

⇒ Start up and trial run

⇒ Normal production

APPRAISAL OF MANAGERIAL COMPETENCE

This is the most difficult job to evaluate the " MAN or MEN" behind the project. It has been the practical experience of the bank/financial institutions that even the most technically feasible and financially/commercially viable project has been a total failure because of lack of management experience. The problem may become all the more serious if the management is dishonest/delinquent rather than inefficient and ineffective. Unfortunately, there is no scientific yardstick by which managerial competence can be judged objectively. For an established group of industrialists floating a new company unit, the banker can have at least, an idea of the background of the promoters. Much also depends whether the existing promoters belong to the 'Blue Chip' group or not. But, in case of a new promoter floating a new project, the problem of judging managerial competence induces some kind of subjectivity in the decision of the banks/financial institutions. In appraisal parlance, such evaluation is known as 'Principle of three Cs' i.e. Character, Capacity and Credit worthiness. The following table will show some principles of credit evaluation in terms of Cs of credit.

Cs	Attribute	How measured
Character	Will the borrower repay the loan according to the schedule?	Previous experience, Credit reference, Market integrity

Capacity	Does the borrower have the ability to repay the loan?	Viability of the project, Generation of surplus
Credit worthiness	Is the borrower creditworthy for the amount of loan applied?	Educational and family background: credit reference
Capital	How much liquid assets the borrower has for investment in the business?	Networth of the borrower: capacity to raise loans from friends and relatives
Collateral	Is the loan backed by sufficient collateral security?	Marketability: Market value of the collateral
Conditions	Do the current economic conditions indicate any problems in the borrower's ability to repay the loan?	General economic condition of the country: stability of the borrower's income relative to these conditions.

Some of the other points that deserve careful consideration in this regard can be enumerated as under:

⇒ Composition of board and the management set-up

⇒ In case the unit is proposed to be set up with foreign collaboration, the standard and status of the collaborators in the international market.

⇒ In case of existing undertaking, the existing state of industrial relations, i.e. rate of employee-turnover, parks and benefits available to the employees, workers' participation in management etc.,

FINANCIAL APPRAISAL

The basic purpose of financial appraisal is to assess whether the unit will generate sufficient surplus so as to meet the outside obligations. Financial appraisal usually examines two aspects of finance:

The cost of the project i.e., the amount required to complete the project and bring it to normal operation

The means of financing the cost i.e. the sources from which the required funds are to be raised.

After computing the cost of the project and means of finance. the various factors required for assessment of financial viability which a banker should carefully examine, are as under:

Reasonableness of cost of project

The project cost should be reasonable: However, assessing reasonableness of the project cost is a very difficult and delicate task. Here, generally, the technique of inter-firm comparison is used which compares the project cost estimates with the cost of comparable units in the same industry.

Debt-Equity ratio: This is a very important consideration as there should not be mismatch between the external debt (long-term) and the equity of the enterprise.

$$\text{Debt-equity ratio} = \frac{\text{Long term debt}}{\text{Own equity}}$$

Equity consists of

Equity share capital

Preference share capital redeemable after 12 years

Free reserves

Subsidy

Note: In case of assisted projects (26% SIDC & 25% promoter)

The shares subscribed by both of them are taken as equity. Long term debt consists of:

1) Long term loans raised or proposed to be raised.

2) Debentures

3) Preference shares redeemable before 12 years.

Maximum Permissible ratio

3 : 1 for small scale industries

2 : 1 for medium scale industries (upto cost of project of 20 cr.)

However, for heavy capital intensive industries like cement plant, fertiliser plant or ship breaking unit, this can be further relaxed.

Promoter's contribution: It is very important to know about the promoter's stake in his own enterprise. As such a minimum amount of promoter's contribution is insisted for consideration of any proposal. From the point of view of all India financial institutions, generally, the minimum contribution of the promoter should be as under.

For units situated in 'A' category districts	=	12.5%
For units situated in 'B' category districts	=	17.5%
For units situated in 'C' category districts	=	20.0%
For any other industrial unit	=	22.5%

Sensitivity Study: This carried out to see that the unit would be able to serve its debts & give reasonable return under less optimistic conditions. For determining, profitability of the project generally projections are obtained over the entire repayment period (say 7 to 10 years) in the following functional areas:

- Cost of Production
- Profitability
- Cash flow
- Debt service coverage ratio
- Break even point

The appraiser should satisfy himself about the reasonableness of the basic assumption on which the above projections are made The important assumptions generally looked into are:

- Capacity build up
- Cost of raw materials
- Estimates of salaries & wages
- Estimates of administrative expenses
- Expected selling price

- Provisions made for depreciation
- Provisions for various taxation liabilities

The assumptions should be reasonable and realistic. In case, the assumption are not pragmatic, the same can be got changed by the bank and fresh figures can be compiled. But the basic consideration the banker should have it that the cash generation position of the unit should be quite comfortable throughout the repayment period. An ideal debt service coverage aimed at is 2:1.

A model problem for ascertaining cash flow projection and the financial viability of the project are given below:

Illustration :

The project appraisal division of a leading car manufacturing company is considering to take up a new project unrelated to its existing range of products. It has prepared the market and technical feasibility report. The project has a life of 5 years. The financial estimates relating to project cost, financing plan, revenue and operating costs and other information are given as under:

The estimated project cost is Rs. 160 crores. It consists of Rs. 96 crores of fixed assets and Rs. 64 crores of working capital margin.

The financing plan is as under:

Equity investment	Rs. 32 crores
Term loans	Rs. 64 crores
Bank finance for working capital	Rs. 32 crores
Trade credit	Rs. 32 crores

The estimated sales and operating costs (excluding depreciation) are Rs. 192 crores and Rs. 144 crores per annum respectively. The depreciation on fixed assets would be @ 20% p.a based on the written down method.

The salvage of fixed assets and current assets will be equal to their book values.

The principal of the term loan will be repaid in four equal annual instalments of Rs. 16 crores each. The first instalment will fall due at the end of the second year and the last instalment at the end of the 5th year. The outstanding term loan would carry interest @ 12% p.a. The levels of short term bank finance and trade credit will remain at Rs. 32 crore level each, on account

of the roll-over phenomenon, till they are paid back at the end of the 5th year. The short term bank finance will carry interest rate of 20% p.a.

The company falls in the 50% tax bracket.

You are required to :

(a) assess the financial viability of the project from equity, long-term funds and total funds points of view.

(b) prepare a financial feasibility report to be submitted to the management for final consideration.

Answer

(a) The financial viability of the above project can be checked by preparing the cash flow projections for a period of five ears from equity, long-term and total funds perspectives.

Statement of Cash flow Projections for the New Project (a comprehensive view)

(Rs in crores)

Years	0	1	2	3	4	5
Total funds	(160)					
Equity	(32)					
Fixed assets	(96)					
Working capital margin	-					
Revenue		192	192	192	192	192
Operating costs		144	144	144	144	144
Depreciation		19.2	15.36	12.28	9.83	7.86
Interest on long term funds		7.68	7.68	5.76	3.84	1.92
Interest on short term borrowings		6.4	6.4	6.4	6.4	6.4
Profit before tax		14.72	18.56	23.56	27.93	31.82
Tax		7.36	9.28	11.78	13.965	15.91
Profit after tax and interest		7.36	9.28	11.78	13.965	15.91

Net salvage value of fixed assets		-	-	-		31.47
Net salvage value of current assets		-	-	-	-	64
Net recovery of working capital margin		-	(16)	(16)	(16)	(16)
Repayment of term-loans						
Retirement of trade creditors		-	-	-	-	(32)
Repayment of short-term borrowings		-	-	-	-	(32)
(I) initial investment						
- equity point of view	(32)					
-long term funds	(96)					
- total funds	(160)					
(ii) Operating cash inflows						
- equity view		26.56	24.6	24.06	23.795	23.77
- long term funds		30.40	28.48	26.94	25.715	24.73
- total funds		33.60	31.68	30.14	28.915	27.93
(iii) Terminal cash flows						
- equity view			(16)	(16)	(16)	15.47
- long term funds		30.40	28.48	26.94	25.715	24.73
- total funds		33.60	31.68	30.14	28.915	27.93
Net cash flows from						
- equity view	(32)	26.56	8.64	8.06	7.795	39.24
- the long term funds	(96)	30.40	28.48	26.94	25.715	88.73
- the total funds view	(160)	33.60	31.68	30.14	28.915	123.4

(b) Profitability Projections for the Final Considerations of the Management

Years	Estimates of working results					
	0	1	2	3	4	5
Cost of project	160					
Expected revenue		192	192	192	192	192
Operating expenses		144	144	144	144	144
Depreciation		19.2	15.36	12.28	9.83	7.86
Interest on long term funds		7.68	7.68	5.76	3.84	1.92
Interest on short term borrowings		6.4	6.4	6.4	6.4	6.4
Profit before tax		14.72	18.56	23.56	27.93	31.82
Tax		7.36	9.28	11.78	13.965	15.91
Profit after tax and interest		7.36	9.28	11.78	13.965	15.91
Net cash accrual		26.56	24.64	24.06	23.795	23.77

Illustration 2

Sai enterprises is interested in assessing the cash flows associated with replacement of an old machine by a new machine. The old machine has a book value of Rs. 90,000 and it can be sold for Rs. 90,000. It has a remaining life of 5 years after which the salvage value is expected to be nil. It is being depreciated annually at the rate of 10% using written down value method. The new machine costs Rs. 4 lakhs. It is expected to fetch Rs. 2.5 lakhs after 5 years when it will no longer be required. It will also be depreciated annually @ 10% using W.d.v method. The new machine is expected to save Rs. 1 lakh in manufacturing costs. Investment in working capital would remain unaffected. The tax rate applicable to the firm is 50%.

You as a project analyst are required to work out the incremental cash flows associated with the replacement of old machine and prepare a statement to be presented to the management for consideration.

Answer

The above case refers to a replacement project. In such cases, one must take the following points into consideration:

- comparison of new machine with the old machine from the overall cash flows point of view;
- comparison of net impact of the 'replacement' or 'retaining the old machine' over the cash flows;
- financing mix used for the replacement and its impact on the interest rates to observe the effect on the profit after interest and tax.

At least two of the above factors should be applied here to analyse the position and present the analysis for managerial consideration. The following cash flow statement will help present the situation better.

Cash flows for the Replacement of machinery of Sai Enterprises

(Rs in crores)

Years	0	1	2	3	4	5
1. Net Investment in the machine	(3.10)					
2. Savings in manufacturing costs		1	1	1	1	1
3. Depreciation on the old machine		0.09	0.081	0.0729	0.0656	0.0590
4. Depreciation on the new machine		0.4	0.36	0.324	0.2916	0.2624
5. Incremental Depreciation		0.31	0.279	0.2511	0.2259	0.2033
6. Incremental taxable profit		0.69	0.721	0.7489	0.7740	0.7966
7. Incremental tax		0.345	0.3605	0.3744	0.3870	0.3983

8. Incremental profit after tax		0.345	0.3605	0.3744	0.3870	0.3983
9. Net incremental salvage value					2.50	
(a) Initial investment (1)	(3.10)					
(b) Operating cash flows (5+8)		0.655	0.6395	0.6255	0.6129	0.6061
(c) Terminal cash flows (a+b+c)	(3.10)	0.655	0.6395	0.6255	0.6129	3.1061

Working notes:

1. Net investment (Rs. 4 lakhs less Rs. 90,000) = Rs. 3.1 lakhs
2. Savings of the new machine are given in the problem, i.e. 1 lakh
3. Incremental depreciation is derived by considering depreciation of the new machine less depreciation of the old machine.
4. Operating cash flows = Incremental depreciation + Incremental profit after tax.

PROFITABILITY ANALYSIS

The financial projection such as profitability estimates, cashflow estimates and projected balance sheets are the basis for assessing the viability of the project. Therefore, verification of profitability estimates is highly important for the proper appraisal of a term loan proposal.

The profitability estimate should always accompany the assumptions based on which the profitability estimates have been prepared.

Ratio analysis

Many important parameters such as sales, operating profit, net profit, equity, debt, current assets. Current liabilities, etc. do not give much information if figure is studied in isolation. If a ratio is calculated between related items, the ratio indicates the relationship between two or more than two variable, thus

giving meaningful information for taking decision. Some of the ratio useful for banks are discussed below.

A. Loan safety ratio

This indicates the relationship between term liabilities and owned funds and helps in assessing the capital gearing. The debt shall include long term loans, debentures, deferred payment preference shares due for redemption between 1 to 3 years. The equity includes ordinary share capital, preference share capital due for redemption after 3 years, investment subsidy, unsecured loans subordinated to the term loan, internal accruals, non refundable deposits in the case of cooperatives.

B. Current ratio (Current assets to current liabilities)

The ratio indicates the liquidity position of the company. Current assets should be more than current liabilities. The acceptable ratio should be between 1.5 to 2.1. The ratio beyond 2.1 will indicate that either the inventories are stocked unnecessarily or the products produced are not sold. The current ratio will indicate the necessity for proper inventory control.

C. Debt service coverage ratio (dscr)

The ratio indicates the capacity of the unit to repay the term loan liabilities and interest thereon. It is important ratio for lending institution as the repayment period has to be suitably fixed based on this ratio. This ratio indicates the cash generation the term liabilities to be paid out of this and balance left for the company's use. Repayment of term loan without generating sufficient cash will lead to reduction in working in the working capital, tight liquidity position and further deterioration in the working of the unit. The acceptable ratio should not be less than 1.5 : 1 which indicates that 1.5 times cash is generated to pay the term, loan liabilities of one time. The formula calculation of the DSCR is given below.

$$DSCR = \frac{\text{Net profit} + \text{Depreciation} + \text{Interest on term Loan liabilities}}{\text{Payment of term loans} + \text{interest on loans}}$$

The DSCR should be calculated for each year of operation and also for the entire repayment period as an advance.

D. Margin of security

The term loans are generally sanctioned against the security of fixed assets. The excess of fixed assets over the term loans provides margin for the term loans.

$$\text{Margin of security} = \frac{\text{Value of fixed assets} - \text{term loans}}{\text{Value of fixed assets}} \times 100$$

E. Productivity Ratio are:

Capital employed to Value of output sales

Capital employed to Net value added

Investment per worker

Productivity per worker

F. Profitability ratio are:

a. percentage of raw material to value of output

b. percentage of wages and salaries to value of output

c. Percentage of interest to value of output

d. Percentage of operating profit to sales

e. Percentage of profit after tax equity

A list showing the method of calculation of above ratios and their usefulness is given separately.

BREAK EVEN POINT (BEP)

The manufacturing cost consists of two costs viz. fixed costs and variable costs. Certain type costs viz. depreciation, interest on term loan, repair and maintenance, rent and insurance, wages and salaries, administrative expenses etc. has to be incurred by the unit irrespective of the level of operation. This cost will not change with the level of operation and they are called fixed costs. All the other costs viz. cost of raw material consumables, power, water, stores, packing charges, selling expenses etc. which vary with the level of operation is called variable cost. The BEP is the level at which the unit should operate to

meet the fixed costs. It is level of operation, where there is no profit or loss for the unit. The BEP is calculated using the following formula

$$\text{BEP} = \frac{\text{Fixed cost}}{\text{Sales-variable cost}} \times \frac{\text{Fixed cost}}{\text{Contribution}}$$

$$\text{\% BEP in terms of installed capacity} = \frac{\text{Fixed cost}}{\text{Contribution}} \times \frac{\text{Max. capacity utilisation}}{100} \times 100$$

The appraising officer should follow uniform policy to divide the total cost into fixed cost and variable cost as certain cost neither remain fixed nor changed in the same proportion in which the level of production changes.

DISCOUNTED CASH FLOW TECHNIQUES

A project should earn sufficient return which should be at least equal to the cost of capital invested in it. The following evaluation techniques helps to identify the best investment proposal amongst the available.

Pay back method

Average rate of return method

Net present value method

Internal rate of return

a) Pay back method

The period required for recovering the entire investment made the project is calculated. The shorter is the period better return. The cash flow (operating profit + depreciation + other non cash write off-tax) is accumulated year by year until it equals the original investment. However, this method ignores the cash inflow received after crossing the pay back period. This method is best suited where the emphasis is on avoidance of long term risk.

b) Average rate of return

Unlike the pay back period method, the entire life of the project is taken into account. The average annual net operating profit (after depreciation) for the

entire life of the project is calculated and the rate of return of original investment in an year is calculated by taking the average of opening and closing book values of the investment in the year. The grand average of such average investment of all years is obtained to know the average investment of the project gives the average rate of return. This method does not give any importance to the time value of the money and also the life differential of the projects.

c) Net present value method (NPV)

Pay back method and average rate of return method does not give importance to the time value of money. The money invested today will not be equal to the money received in the future. Therefore, the time value of the money also should be taken into account while determining the return for the present investment.

Under this method, the future cashflow of all the years during the expected life of the project are discounted at a predetermined cut-off rate and the net present value is obtained. The cut-off rate should be either equal to or more than the cost of the funds. The present investment is an outflow of funds and hence treated as having minus value. If the difference between the present investment and the net present value of cash inflow is positive than it indicates that the profit is greater than the cost of the capital.

d) Internal rate of return (IRR)

NPV method indicates, the net present value of the future cash flows at a predetermined discount rate and the project is accepted for investment if the return of a project, the net cashflow in each year are discounted at various discounting rates till the sum of net present value of cashflow equal the cash outflow. Such a rate of discount which would equate the present value of investments to the present value of future benefits over the life of the projects.

Problem 1

NMH Industries is considering proposal involving procurement of a special machine to produce a new product. The technical team furnished two alternative machines whose investment costs are Rs. 50,000 each and life span is 4 years. After the expire of its useful life, the vendors guaranteed to buy back at Rs. 5,000 each. The management of the company uses certainly equivalent approach to evaluate risky investments. The company's risk adjusted discount

rate is 16% and the risk-free rate is 10%. The expected values of net cash flows (CFAT) with their respective certainly equivalents are as follows:

Year	Machine A		Machine B	
	CFAT	CE	CFAT	CE
	Rs.		Rs.	
1	30,000	0.8	18,000	0.9
2	30,000	0.7	36,000	0.8
3	30,000	0.6	24,000	0.7
4	30,000	0.5	32,000	0.4

Which machine should be purchased, out of the above, by the company?

Answer

NPV Under Certainly Equivalent Approach:

		Machine A				Machine B			
Year	PV factor at 10%	ECFAT	CE	ACFAT	PV amount	ECFAT	CE	ACFAT	PV amount
0	1.000	-50,000	1	-50,000	-50,000	-50,000	1	-50,000	-50,000
1	0.909	30,000	0.8	24,000	21,716	18,000	0.9	16,200	14,725.80
2	0.826	30,000	0.7	21,000	1,7346	36,000	0.8	28,800	23,788.80
3	0.751	30,000	0.6	18,000	1,3518	24,000	0.7	16,800	12,616.80
4 (i)	0.683	30,000	0.5	16,000	1,0245	32,000	0.4	12,800	8,742.40
(ii)	0.683	5,000	1	5,000	3,415	5,000	1	5,000	3,415.00
				NPV	16,240			NPV	13,288.80

The above analysis clears the fog surrounding investment possibilities.

Machine A is resulting in higher NPV compared to Machine B. Therefore, machine A should be purchased having the highest NPV at risk free rate.

Problem 2

Sastha Ltd is considering a project with the following cash flows.

Year	0	1	2
Purchase of Plant	(Rs. 7,000)		
Running Costs		Rs. 2,000	Rs. 2,500
Savings		Rs. 6,000	Rs. 7000

The costs of capital is 8%. Measure the sensitivity of the project to changes in the levels of plant value, running costs and savings (considering each factor at a time) so that NPV becomes zero. Which factor is most sensitive to affect the acceptability of the project.

The PV factors at 8% discount rate are:

0	1.000
1	0.926
2	0.857

Answer

The Net present value of Cashflows:

Year	PV factor (8%)	Plant Cost	Running Cost	Saving	NCF
0	1.000	(7,000)	-	-	(7,000)
1	0.926	-	(2,000 x 0.926) 1,852	(6,000 x 0.926) 5,556	3,704
2	0.857	-	(2,500 x 0.857) 2,142.5	(7,000 x 0.857) 5,999	3,856.5
		(7,000)	(3,994.5)	11,555	Nov = 560.5

The project a may be accepted as it is having a positive NPV of Rs. 560.5.

The sensitivity of project towards various costs can be performed as under.

Sensitivity Analysis

(1) Plant costs may need to be increased by a PV of 560.

i.e. 560.5

7,000 x 5 = 8.007% or by 8%

(2) Running Costs may need to increased by

i.e. 560.5

3,994.5 x 100 = 14.03% or by 14%

(3) Savings may be reduced by

i.e. 560.5

11,555 x 100 = 4.85%

According to this analysis, it is clear that savings having a lowest sensitivity ratio gets affected most while accepting the project.

Problem 3

Ganesh Industries Ltd is considering to acquire a new plant for its existing industry in order to expand the output whose investment will be Rs.2,00,000. The expected life of this new plant is 8 years having no salvage value at the end of 8th year. The future cash flows and their probabilities for a couple of years are as under:

I year Cash flow (Rs.)	Probability	Presuming that cashflow of previous year follows	2nd Year Cash flow	Probability
80,000	0.3	For 80,000	40,000	0.2
			1,00,000	0.6
			1,50,000	0.2

1,10,000	0.4	For 1,10,000	1,30,000	0.3
			1,50,000	0.4
			1,60,000	0.3
1,50,000	0.3	For 1,50,000	1,60,000	0.1
			2,00,000	0.8
			2,40,000	0.1

Required

Plot the project proposal in a decision tree indicating clearly the variations at each level of cash flows and suggest the company whether to proceed with the plant or not if the cost of capital is 10% [P/V Factor at 10% 1st = 0.909; 2nd = 0.826]

Answer

NPV of cash flows at 10% discount rate

	Year (Cash flows in Rs)		PV at 10%		Total	NPV
	1	2	1	2		
a) (i)	80,000	40,000	72,720	33,040	1,05,760	(94,240)
(ii)	80,000	1,00,000	72,720	82,600	1,55,320	(44,680)
(iii)	80,000	1,50,000	72,720	12,39,000	1,96,620	(3,880)
b) (i)	1,10,000	1,30,000	99,990	1,07,380	2,07,370	7,370
(ii)	1,10,000	1,50,000	99,990	1,23,900	2,23,890	23,890
(iii)	1,10,000	1,60,000	99,990	1,32,160	2,32,150	32,150
c) (i)	1,50,000	1,60,000	1,36,350	1,32,160	2,68,510	68,510
(ii)	1,50,000	2,00,000	1,36,350	1,65,200	3,01,550	1,01,550
(iii)	1,50,000	2,40,000	1,36,350	1,98,240	3,34,590	1,34,590

With the help of the above table of contents, decision-tree can be constructed as follows:

t=0 1 2

(year)	Prob. flow	Cash	Prob. flow	Cash	JP	NPV	ENPV
	0.3	Rs. 80,000	0.2	- 40,000	0.06	94,240	-56,544
			0.6	- 1,00,000	0.18	44,680	-8,042.4
			0.2	- 1,50,000	0.06	-3,880	-232.8
	0.3	Rs. 80,000	0.3	- 1,30,000	0.12	7,370	884.4
			0.6	- 1,50,000	0.24	23,890	5,733.6
			0.2	- 1,60,000	0.08	32,150	2,572
	0.3	Rs. 80,000	0.1	- 1,60,000	0.03	68,520	2,055.3
			0.8	- 2,00,000	0.24	1,01,550	24,372
			0.1	-2,40,000	0.03	1,34,590	4,037.7
						ENPV	25164.20

The project is exhibiting a positive expected net present value indicating its success. The project can therefore be accepted.

SOCIAL COST BENEFIT ANALYSIS (SCBA)

It is a methodology for evaluating investment projects from social point of view.

SCBA seeks to assess the utility of a project to society as a whole. It attempts to separate all the expected changes viz. economic, social and environmental likely to arise as a result of implementing the project. These can be represented as inputs and outputs of a project and a price can be put to each of these input an output. Since both inputs and outputs are spread over a number of years, it is necessary to combine the costs and benefits stream that arise over the economic life of the project.

ORIGIN: Methodological guidelines of SCBA have been developed by international agencies like OECD AND UNIDO. India, Planning commission issued in 1975 guidelines for the preparation of feasibility reports for industrial reports.

Socio-Economic Appraisal

Social cost benefit analysis (SCBA) is a perfect necropsy where the identification and determination of the best among project alternatives is made with reference to a country's economic and social prerogatives. It is a systematic procedure for comprehensive review of all the costs, benefits, and effects of a project. Such appraisal is performed for development and infrastructure projects usually by emphasizing the economic, technical, operational, institutional, and financial factors to ensure that the selected project meets all necessary requirements and is implementable.

SCBA focuses on the following objectives:

- to contribute effectively to GDP of an economy;
- to aid in economic development;
- to justify the utilisation of economy's scarce of growth;
- to maintain and protect environment from pollution;
- to educate new lines of functioning that are simple and cost effective;
- to benefit the rural poor and reduce regional imbalances;
- to justify the risks undertaken to implement and the sacrifices made in the process.

Therefore, it is important to identify the major economic, environmental, social and other factors a project may influence directly or indirectly.

Few notable contributions towards social-cost-benefit approach are:

- UNIDO — Guidelines for Project Evaluations released during early 70s
- M.D.Little, J.A.Mirrlees —Appraisal and Planning for Developing Countries

LIMITATIONS OF SCBA

1. No standard method or technique applicable to all types of investment projects.
2. Quantification and measurement of social cost and benefits are formidable.
3. However these limitations can be rectified by removing subjectivity in it.

Summary

Thus the project has to be appraised to ensure that the project will generate sufficient return on the resources invested in it. The viability of the project depends on technical feasibility, marketability of the products at a profitable price, availability of financial resources in time and proper management of the unit. It should be also within the framework of national priorities bases on social cost benefit analysis.

In brief, a project should satisfy the tests of technical, commercial, financial and managerial feasibilities as given above.

* * *

UNIT IV

PROJECT IMPLEMENTATION

NETWORK ANALYSIS

Introduction

Network analysis is a technique of operations research for planning and execution of a project by construction schedules. The network analysis is used for the projects through the activities of sequential manner. The network analysis is a graphical representation of activities consisting of certain configuration of arrows and nodes for showing the logical sequence of various tasks or activities to be performed to achieve project activities.

Typically all projects can be broken down into:

Separate activities (tasks/jobs) - where each activity has an associated duration or completion time (i.e. the time from the start of the activity to its finish)

Precedence relationships - which govern the order in which we may perform the activities, e.g. in a project concerned with building a house the activity "erect all four walls" must be finished before the activity "put roof on" can start and the problem is to bring all these activities together in a coherent fashion to complete the project.

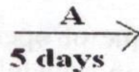
In a large and complex project involving a number of interrelated activities, requiring a number of men, machines and materials, it is not possible for the management to make and execute an optimum schedule just by intuition based on the organizational capabilities and work experience. Management thus, is always on the look out for some methods and techniques which may help them in planning, scheduling and controlling different projects. To achieve this objective of project management, the following techniques of network analysis are widely used

i) Programme Evaluation and Review Technique (PERT)

ii) Critical Path Method (CPM)

TERMINOLOGY USED IN NETWORK ANALYSIS

1. Activities An activity refers to some action, the performance of which requires some time, money and application of other resources. An activity is represented by an arrow mark viz., →. Every activity is named by a capital letter viz., A, B, C, D etc., put above the arrow mark. Further, the time taken by each activity is indicated just below its arrow mark. Example,

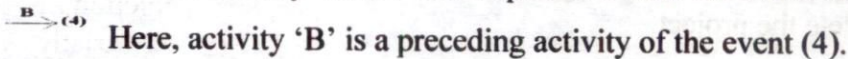


Types of activities

i) Preceding activity
ii) Succeeding activity
iii) Concurrent activity
iv) Dummy activity
v) Critical activity
vi) Non-critical activity
vii) Preceding activity

Preceding Activity

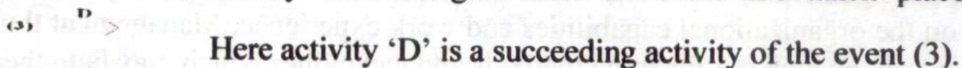
It is that activity which is completed before an event takes place viz.,



Here, activity 'B' is a preceding activity of the event (4).

Succeeding activity

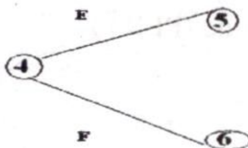
It is that activity which begins after an event has taken place i.e.



Here activity 'D' is a succeeding activity of the event (3).

Concurrent activity

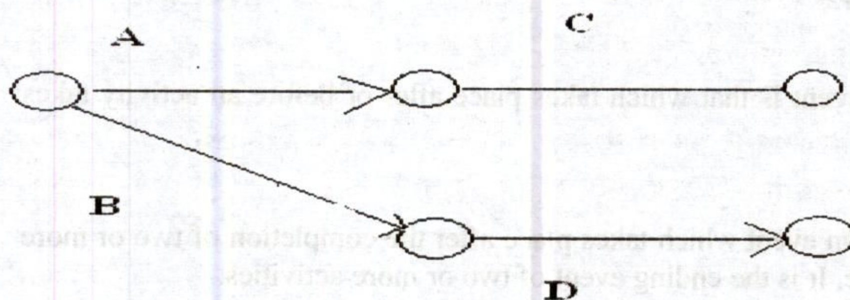
It is that activity which is performed along with another activity at the same time.



Here activity E is a concurrent activity of the activity F.

Dummy activity

It is that activity the performance of which requires neither any time nor any resources. It is a false activity indicated by the broken lines. Such activities are shown in a network diagram only to designate a precedence relationship i.e., to show that the activities and events in network diagram are in a proper order. For example, in a project if 'A' and 'B' are the preceding activities of the activity 'C' while 'B' is the only preceding activity of activity 'D' then using dummy activity it can be shown as follows



Critical activity

It is that activity which falls along with the critical path. Any delay caused in the performance of such activity will cause delay in the completion of the project in toto and hence such activities are to be completed strictly according to the time schedule. Such activities are also called bottleneck activities.

Non-critical activity

It is that activity which falls on a path other than the critical path. Delay in the performance of such activities does not cause delay in the performance of the project. Such activities are also known as non-bottleneck activities.

2. Event

An event refers to the starting or ending point of an activity and it requires some time. It is represented by a figure within a circle viz., 1, 2. 3, 4 and so on. An event cannot be achieved until all the activities preceding to it have

been completed. In a network diagram there will be one starting event and one ending event.

Types of event

i) Simple event
ii) Node event
iii) Burst event
iv) Head event
v) Tail event
vi) Simple event

Simple event

A simple event is that which takes place after or before an activity takes place.

Node event

A node is an event which takes place after the completion of two or more activities at a time. It is the ending event of two or more activities.

Burst event

A burst is an event immediately after which two or more activities start. In other words, it is the beginning event of two or more activities.

Head event

A head event is an event where an activity ends. Thus, if an activity, say 'C' ends with the event 6, the event six will be the head event.

Tail event

A tail event is an event where an activity begins. Thus, if an activity, say 'B' begins after the event 2, the event 2 will be the tail event.

3. Constraints

In PERT and CPM, activities are determined by keeping in view various conditions and constraints. Constraints refer to inequalities which establish relationship between the sequences of network activities. In PERT, there may occur some circumstances where, unless an activity is completed, the other

activity cannot be started. For example, $X < Y$ will mean that unless activity X is completed, the activity Y cannot be started. The constraints are denoted by $<$.

NETWORK DIAGRAM

It is a graphical representation of logically and sequentially connected arrows and nodes representing activities and events of a project. The network diagram is also known as 'arrow diagram'. To construct a network diagram, the project is split into activities. Starting and finishing events of the project are then decided. After deciding the precedence order, the activities are put in a logical sequence by using the graphical notations.

CONSTRUCTION OF NETWORK DIAGRAM

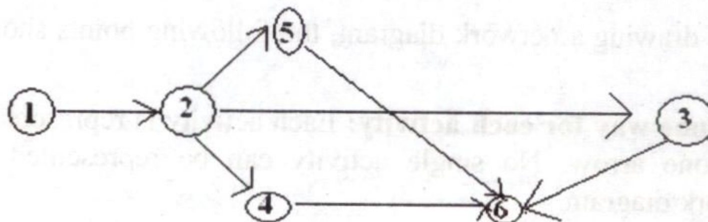
While drawing a network diagram, the following points should be kept in mind:

1. **Only one way for each activity:** Each activity is represented by one and only one arrow. No single activity can be represented twice in the network diagram.
2. **2. Certain direction of each activity:** There must be certain direction of each activity i.e., the arrow must be kept straight and not curved or bent.
3. **Identification of activity:** All the activities should be identified by various nodes. For this purpose, the nodes are given separate numbers so that one node is differentiated with the other.
4. **More than one activity:** At one node, more than one activity can start as well as more than one activity can end. Prior to first node, there in no preceding activity and after the last node, there is no succeeding activity; on the remaining nodes, more than one activity can start and end.
5. **Relation of an activity with two nodes:** Only one activity can be related with two nodes. This rule is needed so that the starting time and ending time of the work could be depicted on it.
6. **Left to right:** The flow of diagram should be from left to right.
7. **Tail and head event:** Each activity must have a tail and a head event. No two or more activities may have the same tail and head events.

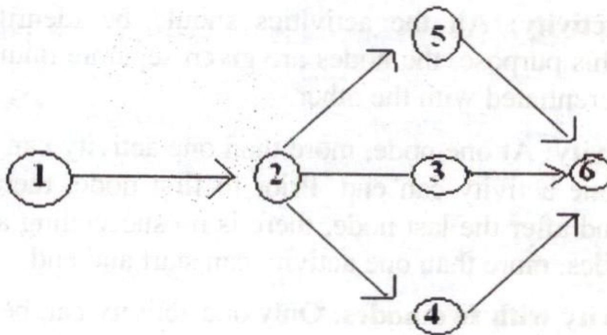
8. **Angle:** Angle between the arrows showed is as large as possible.

9. **Analysis of activities:** In PERT and CPM, a project is divided in various activities and before starting an activity, all activities preceding to it, must be completed. The network diagram should be developed on the basis of logical and technical relationship between various activities of the project. Thus, the networking requires that the project be considered in an analytical manner and the predecessor-successor relationships between various activities are clearly explained.

10. **Arrow:** Arrow should not cross each other unless it is completely unavoidable.



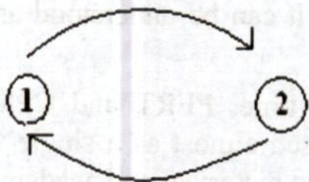
(a) Incorrect



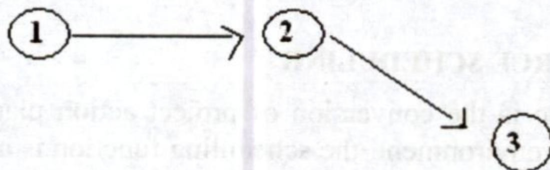
(b) Correct

11. **Minimize the dummy activities:** Efforts should be made to minimize the dummy activities to avoid the complicacy of network diagram.

12. **Separate nodes:** Nodes should be separate for starting and ending event i.e., the network should not be circular.

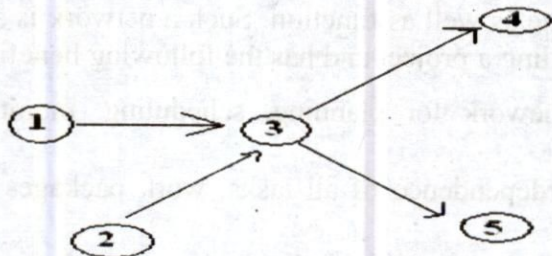


(a) Incorrect



(b) Correct

13. **One point:** There should be only starting point and one end point in a network diagram.



Incorrect

CONLUSION

Network analysis is a vital technique in project management. It enables us to take a systematic quantitative structured approach to the problem of managing a project through to successful completion. Moreover, it has a graphical representation which means it can be understood and used by those with a less technical background.

With the passage of time, PERT and CPM applications started over-lapping and now they are used almost as a single technique and the difference between the two is only of the historical and academic interest.

Thus, the network analysis technique helps the organization by preparing appropriate schedule for starting and ending the project. So the organization completes the project within a particular time.

PROJECT RESOURCE SCHEDULING

A schedule is the conversion of project action plan into an operating timetable in project environment, the scheduling function is more important than it would be in an ongoing operation because projects lack the continuity of day-to-day operations and often present much more complex problems of coordination. Project scheduling is important that a detailed schedule is sometimes a customer-specified requirement.

The basic approach of all scheduling techniques is to form a network of activity and event relationships that graphically portrays the sequential relations between the tasks in a project. Tasks that must precede or follow other tasks are then clearly identified, in time as well as function. Such a network is a powerful tool for planning and controlling a project and has the following benefits,

- It is consistent framework for planning, scheduling, monitoring and controlling the project.
- It illustrates the interdependence of all tasks, work packages and work elements.
- It denotes the times when specific individuals and resources must be available for work on a given task.
- It aids in ensuring that the proper communications take place between departments and functions.

- It determines an expected project completion date.
- It identifies so called critical activities that, if delayed, will delay the project completion time.
- It also identifies activities with slack that can be delayed for specified periods without penalty, or from which tasks may be temporarily borrowed without harm.
- It determines the dates on which tasks may be started or must be started if the project is to stay on schedule.
- It illustrates which tasks must be coordinated to avoid resource or timing conflicts.
- It also illustrates which tasks may be run, or must be run, in parallel to achieve the predetermined project completion date.
- It relives some inter-personnel conflict by clearly showing task dependencies.
- It may depending on the information used allow an estimate of the profitability of project completion by various dates, or the date corresponding to a particular a priori probability.

In project management, a schedule consists of a list of a project's terminal elements with intended start and finish dates.

Before a project schedule can be created, a project manager should typically have a work breakdown structure (WBS), an effort estimate for each task, and a resource list with availability for each resource. If these are not yet available, it may be possible to create something that looks like a schedule, but it will essentially be a work of fiction. They can be created using a consensus-driven estimation method like Wideband Delphi. The reason for this is that a schedule itself is an estimate: each date in the schedule is estimated, and if those dates do not have the buy-in of the people who are going to do the work, the schedule will be inaccurate.

In many industries, such as engineering and construction; the development and maintenance of the project schedule is the responsibility of a full time scheduler or team of schedulers, depending on the size of the project. And though the techniques of scheduling are well developed, they are inconsistently applied throughout industry. Standardization and promotion of scheduling best practices are pursed by the Association for the Advancement of Cost Engineering (AACE), and the Project Management Institute (PMI). In large

corporations, Scheduling, as well as Cost, Estimating, and Risk Management are organized under the department of Project Controls.

Many project scheduling software products exist which can do much of the tedious work of calculating the schedule automatically, and plenty of books and tutorials dedicated to teaching people how to use them. However, before a project manager can use these tools, he or she should understand the concepts behind the WBS, dependencies, resource allocation, critical paths, Gantt charts and earned value. These are the real keys to planning a successful project.

The scheduling techniques helps to achieve goals. The most common techniques are:

- Gantt or Bar charts
- Milestone charts
- Line of Balance
- Networks
  - Program Evaluation and Review Techniques(PERT)
  - Arrow Diagram Method(ADM or CPM)
  - Precedence Diagram Method (PDM)
  - Graphical Evaluation and Review Techniques(GERT)

Gantt chart

A **Gantt chart** is a popular type of bar chart that illustrates a project schedule. Gantt charts illustrate the start and finish dates of the terminal elements and summary elements of a project. Terminal elements and summary elements comprise the work breakdown structure of the project. Some Gantt charts also show the dependency (i.e., precedence network) relationships between activities. Gantt charts can be used to show current schedule status using percent-complete shadings and a vertical line.

Gantt charts have become a common technique for representing the phases and activities of a project work breakdown structure (WBS), so they can be understood by a wide audience.

Master scheduling

The Master Scheduling application provides management with the visibility of future load, inventory investment, production, and delivery

commitments. It drives Material Requirements Planning with independent demand requirements coming from either a forecast, customer demand, or a combination of both. A forecast can be entered for any item in the inventory master file within the Master Scheduling application. In addition, when the Master Scheduling application is interfaced to the Order Entry application, actual customer demand will met against forecast resulting in an available-to-promise calculation.

Features

- Forward/backward netting of demand to forecast
- Consumption by forecast or available-to-promise by part
- Time-phased order point by part
- Master schedule to forecast pegging
- Order entry pegging on master schedule
- Demand type identification and pegging
- Forecast, master schedule and worksheet history option
- Multiple site master schedule
- Available-to-promise processing
- Projected available processing
    - Master scheduling inquiries and reports are:
        - Forecast
        - Master schedule
        - Master schedule Forecast history
        - Master schedule history
        - Demand
        - Master schedule worksheet history
    - Complete interface from Realtime Software Package Master Planning
    - Complete interface with Realtime Software Package Order Entry

PROJECT MANAGEMENT SOFTWARE-GENERAL FACTORS

How is software for project management selected? Practical considerations can short - cut the software selection process. If computer facilities already exist, and are easily accessible, it may just be a matter of discovering whether a program has already been acquired. If not, or if that

program is inadequate, the first step might be to find out what program are available for the computer equipment, which is currently installed.

Computer manufactures maintain catalogues of programs, which have been made commercially available for their equipment. Organisations in the industry can advise on what may be available, or point out the major companies who supply software for project management.

Even if the planner does have access to a large company computer with an appropriate program, he should consider that he will be sharing a facility with other users. He will not necessarily have the highest priority among them. Before committing himself to use the locally available facilities, he should experiment to see whether delays in computer across or in calculation time when using this equipment are acceptable in the context of the project he is controlling.

It may be better acquire a small computer completely under his own control, rather than to rely upon a large shared facility. The wider range of possible machines under these circumstances will imply a wider selection of computer programs. Many programs are only available for a restricted range of computer equipment. The planner will wish to choose a combination of hardware and software appropriate to his situation.

Consider in a little more detail some of the factors, which affect the choice of software package. Many of the categories already summarised will overlap a little. Capacity and speed, for example, are interrelated in that a theoretical ability to handle networks of many activities may in fact be unusable because long calculation times make the analysis of large networks undesirable.

The maximum network size which a computer program can handle may vary from a few tens of activities to millions. The limitation almost always applies to a single network. The user is allowed to have many independent networks but no one of them may exceed (say) 2000 activities.

The limit on the number of activities per network is generally determined by the computational algorithm used in the program and by the memory capacity of the computer. The larger the memory, generally the larger the network which can be handled with a given computational method.

Sometimes, programs with a relatively low limit of network size will calculate network sections independently and then combine the results. Taking a

very crude example, consideration network which divides itself into two distinct halves-say phase I and phase II of a project – whereby the connections between one part and the next run entirely through a single activity (perhaps a decision point as to whether or not to commence the second part at all). Then it is very easy very easy to compute part I first, and then, use the earliest finish of the end of part I as the project start of part II.

If there is a definite required end date to the project, as is so often then case, then that end data can be applied to part II of the project. The latest start of the first activity of part II can then be applied to part I as a required finish date. To express the computation of the network in critical path terms, please refer to Fig. Notice that three computational passes are required to calculate the two networks.

If a program must resort to this kind of 'subnetting' or 'interfacing' in order to be able to calculate a network of the required size, it will probably not be operationally efficient.

The number of passes of the data tends to grow rapidly as the number of independent network sections increases, and as the number of points of contact between them increases too.

In general it is unwise to attempt to stretch the capacity of a program in this way. Better use a tool that will be adequate for the maximum network size envisaged. Allow an appropriate safety margin for the fact that networks tend to grow, particularly if there is a computer available to solve them (yet another of the countless corollaries of Parkinson's first law).

The above comments should not be taken as advice to avoid subnets and interfaces in general – only in those cases where they are forced upon the user by computer-related limitations. It may well be convenient to divide a project into subnets, provided that the computer program being used can take them in a single mouthful for calculation purposes.

Generally, subnets can be numbered independently, so that same activity number or event number can be used in two separate without fear of confusion. This is particularly helpful when the same general pattern is repeated in different parts of an overall network – for example the installation of pumps occurs many times in networks describing the construction of an oil refinery. It may be possible to duplicate one network and include it in many different places.

It may be convenient to assign responsibility for different network sections to different individuals, particularly if the network is large. Normally one will allocate a different range of possible activity numbers to each person responsible for a network section, but such schemes have been known to go awry. When they do, the logic is sometimes difficult to disentangle.

Where subnets are used, they must be able to connect at on or more points into the main network. These connection points are commonly called interfaces. The activities which are identified as interfaces do share a common numbering system with the overall network, and so provide connections with it.

The fewer connection points for each subnet, the simpler will be the evaluation of parts which cross several subnets and hence perhaps more than one area of responsibility. If each planner working on a projects has activities separated into his own individual subnet to subnets, he can more easily update the tasks under his control with progress information, without needing close co-ordination with his colleagues.

Many computer programs have a quoted limit of 32,000 events for activity-on-arrow network, or 32,000 activities for precedence networks.

The Particular figure is a common one because it arises as a consequence of a popular type of computer design. This design tends to group the fundamental binary bits of which computer memory is constructed into sets of eight at a time. Two sets of eight makes a conveniently sized storage medium for holding a sequential activity counter.

Such a counter can count up to 32,767 easily, and with some difficulty can be persuaded to count up to double that figure. This is why many programs quote a theoretical limit of 32,000 or 64,000 activities. Nevertheless, the practical maximum network size may be well below this figure, either because a very large computer memory could be needed for the program in question to attain such a maximum, or because calculation time might be unacceptably long.

There may well be several capacity limitations to a given computer program. There may be different limitations on the network size which can be handled in resources analysis as opposed to time analysis. This is because different computation all methods will be used for these two functions. There may be limits to the number of resources which can be processed per projects,

and limits to the number of resources which any one activity can be specified as using.

FACTORS INFLUENCING PRICE OF PROJECT SOFTWARE

The main factors affecting the price of computer programs are:

1. The maximum network size, which can be computed.
2. The kind of data which can be handle (arrow, precedence, arrow and precedence, resources, costs, materials and other associated data).
3. The calculation features (time analysis, resources aggregation, resource smoothing, probabilistic analysis, cost performance analysis, and so on).
4. Flexibility of output reports, graphical presentation of results, and the like.
5. Ease of use (screen input, menus, special updating methods).
6. Speed (calculation speed, updating speed, report production speed).
7. Level of support provided to the user (documentation, training, and hotlines).
8. Software maintenance costs and enhancement schemes.

* * *

UNIT V

PERT & CPM

The Project Evaluation and Review Technique commonly abbreviated PERT a model for project management to analyze and represent the tasks involved in completing a given project. PERT is basically a method to analyze the tasks involved in completing a given project, especially the time needed to complete each task, and identifying the minimum time needed to complete the total project. This model was invented by Booz Allen Hamilton.

PERT was developed in the 1950's, primarily to simplify the planning and scheduling of large and complex projects. It was able to incorporate uncertainty by making it possible to schedule a project not knowing precisely the details and durations of all the activities. It is more of an event-oriented technique rather than start- and completion-oriented, and is used more in R&D-type projects where not cost but time is a major factor

The most famous part of PERT is the "PERT Networks", charts of timelines that interconnect. PERT is intended for very large-scale, one-time, complex, non-routine projects.

PERT Terminology and Conventions

Conventions

- A **PERT chart** is a tool that **facilitates** decision making; The first draft of a PERT chart will number its events sequentially in 10s (10, 20, 30, etc.) to allow the later insertion of additional events.
- Two consecutive events in a PERT chart are linked by **activities**, which are conventionally represented as arrows in the diagram above.
- The events are presented in a logical sequence and no activity can commence until its immediately preceding event is completed.
- The planner decides which milestones should be PERT events and also decides their "proper" sequence.
- A PERT chart may have multiple pages with many sub-tasks.

- PERT Charts are one of the tools used in the Earned Value Management Technique EVMT, used by many corporations today to track Earned Value.

Terminology

- A *PERT event*: is a point that marks the start or completion of one or more tasks. It consumes **no time**, and uses **no resources**. It marks the completion of one or more tasks, and is not "reached" until **all** of the activities leading to that event have been completed.
- A *predecessor event*: an event (or events) that immediately precedes some other event without any other events intervening. It may be the consequence of more than one activity.
- A *successor event*: an event (or events) that immediately follows some other event without any other events intervening. It may be the consequence of more than one activity.
- A *PERT activity*: is the actual performance of a task. It consumes **time**, it requires **resources** (such as labour, materials, space, machinery), and it can be understood as representing the time, effort, and resources required to move from one event to another. A PERT activity cannot be completed until the event preceding it has occurred.
- *Optimistic time* (**O**): the minimum possible time required to accomplish a task, assuming everything proceeds better than is normally expected
- *Pessimistic time* (**P**): the maximum possible time required to accomplish a task, assuming everything goes wrong (but excluding major catastrophes).
- *Most likely time* (**M**): the best estimate of the time required to accomplish a task, assuming everything proceeds as normal.
- *Expected time* (**T_E**): the best estimate of the time required to accomplish a task, assuming everything proceeds as normal (the implication being that the expected time is the average time the task would require if the task were repeated on a number of occasions over an extended period of time).

  $$\mathbf{T_E = (O + 4M + P) \div 6}$$

- *Critical Path*: the longest possible continuous pathway taken from the initial event to the terminal event. It determines the total calendar time

required for the project; and, therefore, any time delays along the critical path will delay the reaching of the terminal event by at least the same amount.

- *Lead time*: the time by which a *predecessor event* must be completed in order to allow sufficient time for the activities that must elapse before a specific PERT event is reached to be completed.
- *Lag time*: the earliest time by which a *successor event* can follow a specific PERT event.
- *Slack*: the slack of an event is a measure of the excess time and resources available in achieving this event. Positive slack would indicate *ahead of schedule*; negative slack would indicate *behind schedule*; and zero slack would indicate *on schedule*.

The Network Diagram

In a project, an activity is a task that must be performed and an event is a milestone marking the completion of one or more activities. Before an activity can begin, all of its predecessor activities must be completed. Project network models represent activities and milestones by arcs and nodes. PERT originally was an *activity on arc* network, in which the activities are represented on the lines and milestones on the nodes. Over time, some people began to use PERT as an *activity on node* network. For this discussion, we will use the original form of activity on arc.

The PERT chart may have multiple pages with many sub-tasks. The milestones generally are numbered so that the ending node of an activity has a higher number than the beginning node. Incrementing the numbers by 10 allows for new ones to be inserted without modifying the numbering of the entire diagram. The activities are labeled with letters along with the expected time required to complete the activity.

Steps in the PERT Planning Process

PERT planning involves the following steps:

1. Identify the specific activities and milestones.
2. Determine the proper sequence of the activities.
3. Construct a network diagram.

4. Estimate the time required for each activity.
5. Determine the *critical path.*
6. Update the PERT chart as the project progresses.

1. Identify Activities and Milestones

The activities are the tasks required to complete the project. The milestones are the events marking the beginning and end of one or more activities. It is helpful to list the tasks in a table that in later steps can be expanded to include information on sequence and duration.

2. Determine Activity Sequence

This step may be combined with the activity identification step since the activity sequence is evident for some tasks. Other tasks may require more analysis to determine the exact order in which they must be performed.

3. Construct the Network Diagram

Using the activity sequence information, a network diagram can be drawn showing the sequence of the serial and parallel activities. For the original activity-on-arc model, the activities are depicted by arrowed lines and milestones are depicted by circles or "bubbles".

If done manually, several drafts may be required to correctly portray the relationships among activities. Software packages simplify this step by automatically converting tabular activity information into a network diagram.

4. Estimate Activity Times

Weeks are a commonly used unit of time for activity completion, but any consistent unit of time can be used.

A distinguishing feature of PERT is its ability to deal with uncertainty in activity completion times. For each activity, the model usually includes three time estimates:

- *Optimistic time* - generally the shortest time in which the activity can be completed. It is common practice to specify optimistic times to be three standard deviations from the mean so that there is approximately a 1% chance that the activity will be completed within the optimistic time.

- *Most likely time* - the completion time having the highest probability. Note that this time is different from the *expected time*.
- *Pessimistic time* - the longest time that an activity might require. Three standard deviations from the mean is commonly used for the pessimistic time.

PERT assumes a beta probability distribution for the time estimates. For a beta distribution, the expected time for each activity can be approximated using the following weighted average:

Expected time = (Optimistic + 4 x Most likely + Pessimistic) / 6

This expected time may be displayed on the network diagram.

To calculate the variance for each activity completion time, if three standard deviation times were selected for the optimistic and pessimistic times, then there are six standard deviations between them, so the variance is given by:

$$[(\text{Pessimistic} - \text{Optimistic}) / 6]^2$$

5. Determine the Critical Path

The critical path is determined by adding the times for the activities in each sequence and determining the longest path in the project. The critical path determines the total calendar time required for the project. If activities outside the critical path speed up or slow down (within limits), the total project time does not change. The amount of time that a non-critical path activity can be delayed without delaying the project is referred to as *slack time*.

If the critical path is not immediately obvious, it may be helpful to determine the following four quantities for each activity:

- ES - Earliest Start time
- EF - Earliest Finish time
- LS - Latest Start time
- LF - Latest Finish time

These times are calculated using the expected time for the relevant activities. The earliest start and finish times of each activity are determined by working forward through the network and determining the earliest time at which an activity can start and finish considering its predecessor activities. The latest start and finish times are the latest times that an activity can start and finish

without delaying the project. LS and LF are found by working backward through the network. The difference in the latest and earliest finish of each activity is that activity's slack. The critical path then is the path through the network in which none of the activities have slack.

The variance in the project completion time can be calculated by summing the variances in the completion times of the activities in the critical path. Given this variance, one can calculate the probability that the project will be completed by a certain date assuming a normal probability distribution for the critical path. The normal distribution assumption holds if the number of activities in the path is large enough for the central limit theorem to be applied.

Since the critical path determines the completion date of the project, the project can be accelerated by adding the resources required to decrease the time for the activities in the critical path. Such a shortening of the project sometimes is referred to as *project crashing*.

6. Update as Project Progresses

Make adjustments in the PERT chart as the project progresses. As the project unfolds, the estimated times can be replaced with actual times. In cases where there are delays, additional resources may be needed to stay on schedule and the PERT chart may be modified to reflect the new situation.

Benefits of PERT

PERT is useful because it provides the following information:

- Expected project completion time.
- Probability of completion before a specified date.
- The critical path activities that directly impact the completion time.
- The activities that have slack time and that can lend resources to critical path activities.
- Activity start and end dates.

Limitations

- The activity time estimates are somewhat subjective and depend on judgement. In cases where there is little experience in performing an activity, the numbers may be only a guess. In other cases, if the person or

group performing the activity estimates the time there may be bias in the estimate.

- Even if the activity times are well-estimated, PERT assumes a beta distribution for these time estimates, but the actual distribution may be different.
- Even if the beta distribution assumption holds, PERT assumes that the probability distribution of the project completion time is the same as that of the critical path. Because other paths can become the critical path if their associated activities are delayed, PERT consistently underestimates the expected project completion time.

The underestimation of the project completion time due to alternate paths becoming critical is perhaps the most serious of these issues. To overcome this limitation, Monte Carlo simulations can be performed on the network to eliminate this optimistic bias in the expected project completion time.

Project Monitoring

Project monitoring means to keep a careful check of project activities over a period of time. The key things to be planned, monitored and controlled are time (schedule), cost (budget) and performance (specifications).

Designing the monitoring system

In setting up any monitoring system is to identify the key factors to be controlled. The PM wants to monitor performance, cost and time but must precisely which specific characteristics of performance ,cost and time should be controlled and then establish exact boundaries within which control should be maintained. There may also be other factors of importance worth noting, at least at milestones or review points in the life of the project.

The best source of items to be monitored is the project action plan. The set of action plans that describe what is being done, when and the planned level of resource usage for each task, work package and work element in the project. The monitoring system is a direct connection between planning and control. The action plan furnishes the key items that must be measured and reported to the control system.

Monitoring should concentrate primarily on measuring various facets of output rather than intensity of activity.

Plan of activities in monitoring

- what needs to be done
- when it should be done
- who will be involved in doing it
- what resources are needed to do it
- how long it will take to do
- how much it will cost.

A large proportion of all data collected takes one of the following forms, each of which is suitable for some types of measures.

- Frequency counts
- Raw numbers
- Subjective numeric ratings
- Indicators
- Verbal measures

Monitoring indicators

Monitoring indicators are quantitative and qualitative signs for measuring or assessing the achievement of project activities and objectives. The indicators will show the extent to which the objectives of every activity have been achieved. Monitoring indicators should be explicit, pertinent and objectively verifiable.

Monitoring Indicators are of four types, namely;

- **Input indicators:** describe what goes on in the project
- **Output indicators:** describe the project activity
- **Outcome indicators:** describe the product of the activity
- **Impact indicators:** measure change in conditions of the community

Monitoring methods

Work out the most appropriate way of monitoring the work,

- meetings
- diaries
- reports on progress
- accounts, reports on finances

Reports

These do not have to be very long. Their purpose needs to be clear - to report on activities and achievements. They give a clear and helpful record of exactly what has been achieved. They are short and to the point. This kind of report will help them in future planning and would clearly inform the Government or a donor agency of what has taken place.

Diaries

A helpful way of recording information would be to use one side of a note book for example, for daily or weekly plans. Write on the other side what actually happened. Keeping a work diary like this will help you also to evaluate your own work. What are you doing that is most helpful and brings effective results? Take time to ask people in the community about how they feel.

Finances

Donor agencies often transfer funds in quarterly or half yearly payments which may not fit in with the planned project expenses. Planning of expenditure may need to take this into account. Careful budgeting and planning will be of great help in this.

Meetings

Confidence and trust are vital. There is a possibility that monitoring may be seen as a way of checking up on people. It must be a joint effort that everyone is involved with in some way or another.

For monitoring to be a useful tool, the information that is collected must be used effectively in all sorts of ways:

- Improve the timing of planned activities.
- Adjust budgets.
- Improve future planning and decision making.
- Indicate where future work is necessary.
- Inform other agencies of activities, to encourage cooperation and publicity.
- Inform funding agencies of progress and future plans.

CRITICAL PATH METHOD (CPM)

Introduction

In a large and complete project involving a number of interrelated activities, requiring a number of men, machines and materials, it is not possible for the management to make and execute an optimum schedule just by intuition based on the organizational capabilities and work experience. Management thus, is always on the look out for some methods and techniques which may help them in planning, scheduling and controlling different projects. To achieve this objective of project management, the following techniques of network analysis are widely used for planning, scheduling and controlling the large and complex projects

- Programme Evaluation and Review Techniques (PERT)
- Critical Path Analysis Method (CPM)

CRITICAL PATH METHOD (CPM)

The **Critical Path Method**, abbreviated **CPM**, or **critical path analysis**, is a mathematically based algorithm for scheduling a set of project activities. It is a very important tool for effective project management.

It was developed in the 1950s in a joint venture between DuPont Corporation and **Remington Rand Corporation** for managing plant maintenance projects. Today, it is commonly used with all forms of projects, including construction, software development, research projects, product development, engineering, and plant maintenance, among others. CPM involves the following three factors

- Drafting the design of programme or project
- The programme of project drafted is evaluated
- The programme or project is reviewed after the evaluation

EVOLUTION OF NETWORK TECHNIQUES

On the end of the 18^{th} Century, the decision- making process was mainly depended on the managerial capabilities, experiences and academics background of managers. In the early stage of 19^{th} century, the pioneers of scientific management started developing the scientific management techniques. During the World War I, Henry L. Gantt developed Gantt chart for production

scheduling which was later on modified to bar chart for the purpose of project and production scheduling.

The network techniques of PERT and CPM were concurrently developed in 1957. In the beginning, CPM was used for planning and scheduling of constructional projects. It was also used for scheduling the maintenance shutdowns. The construction industry in general and the petro-chemical industry in particular were the major areas of CPM applications.

With the passage of time, PERT and CPM applications started over-lapping and now they are used almost as a single technique and the difference between the two is only the historical and academic interest.

The essential technique for using CPM is to construct a model of the project that includes the following:

- A list of all activities required to complete the project (also known as Work breakdown structure),
- The time (duration) that each activity will take to completion, and
- The dependencies between the activities.

Using these values, CPM calculates the starting and ending times for each activity, determines which activities are critical to the completion of a project (called the **critical path**), and reveals those activities with "float time" (are less critical).

In project management, a **critical path** is the sequence of project network activities with the longest overall duration, determining the shortest time possible to complete the project. Any delay of an activity on the critical path directly impacts the planned project completion date (i.e. there is no float on the critical path). A project can have several, parallel near critical paths. An additional parallel path through the network with the total durations shorter than the critical path is called a sub-critical or non-critical path.

TYPES OF CPM NETWORKS:

There are two types of CPM network namely

- Activity - On - Arrow diagram or "arrow diagram"
- Activity - On - Node diagram or "precedence diagram"

TERMINOLOGY USED IN NETWORK ANALYSIS

Network Analysis

It is a technique of operations research for planning and execution of a project by constructing the schedules. The network anaylsis is used for the projects through the activites of sequential manner. The network anaylsis is a graphical representation of activities consisting of certain configuration of arrows and nodes for showing the logical sequence of various tasks or activities to be performed to achieve the project activities.

D = Duration

ES = Earliest Start Earliest finish time of preceding event

EF =Earliest Finish EF = ES + D

LS =Latest Start LS = LF - D

LF =Latest Finish LF = LS + D = Latest start time of following event

TF=Total Float TF = LF - EF = LS - ES

FF =Free Float FF = ES (following activity) - EF (this activity)

TF =Time activities' start or finish can be delayed without delaying project completion.

FF =Time single activity's finish can be delayed without delaying the ES for a following activity.

Event Node 

An event is the instant when an activity is started or completed. Events are represented by circles called nodes. They do not consume time. They occur when all the activities entering the node are completed.

Dummy Arrow 

Dummy arrows are used to transfer logic from one event node to another in the net work. They are represented by broken arrows. A dummy arrow has

zero duration and does not represent an activity. These symbols are used to represent the relation ships among the activities.

HOW TO DRAW IT

- Specify the individual activities.
- Determine the sequence of those activities.
- Draw a network diagram
- Estimate the completion time for each activity
- Identity the critical path (longest path through the network)
- Update the CPM diagram as project progresses.

SPECIFY THE INDIVIDUAL ACTIVITIES

From the work breakdown structure, a listing can be made of all the activities in the project. This listing can be used as a basis for adding sequence and duration information in the later steps.

DETERMINE THE SEQUENCE OF THE ACTIVITIES

Some activities are dependent on the completion of others. A listing of the immediate predecessors of each activity is useful for constructing the CPM network diagram.

DRAW A NETWORK DIAGRAM

Once the network and the sequencing has been defined, \ the CPM diagram can be drawn. CPM was originally developed on Activity on node (AON) network, but some project planners prefer to specify the activities on the arcs.

ESTIMATE THE COMPLETION TIME FOR EACH ACTIVITY

The time required to complete each activity can be estimated using past experience or the estimates of knowledgeable persons. CPM is deterministic model that does not take into account variation in the completion time, so only one number is used for an activity's time estimate.

IDENTITY THE CRITICAL PATH

The critical path is the longest duration path through the network. The significance of the critical path is that the activities that lie on it cannot be

delayed with delaying the project. Because of its impact on the entire project, critical path analysis is the most important part of project planning.

The critical path can be identified by determining the following four parameters for each activity:

ES- Earliest starting time

EF- Earliest Finishing time

LF- Latest Finishing time

LS-Latest starting time

SLACK TIME

It is the time between the earliest and latest start time, or between the earliest and latest finish time. Slack is the amount of time that can be delayed past its earliest start or earliest finish without delaying the project.

The critical path is the path through the project network in which none of the activities have slack, that is, the path for which ES=LS and EF=LF for all activities in the path. A delay in the critical path delays the project. Similarly, to accelerate the project it is necessary to reduce the total time required for the activities in the critical path.

UPDATE CPM DIAGRAM

As the project progresses, the actual task completion time will be known and the network diagram can be updated to include this information. A new critical path may emerge, and the structural changes can be made in the network if the project requirements change.

CALCULATIONS FOR CRITICAL PATH SCHEDULING

Critical Path Scheduling Algorithms (Activity-on-Branch Representation)

Event Numbering Algorithm

***Step 1*: Give the starting event number 0.**
***Step 2*: Give the next number to any unnumbered event whose predecessor events are each already numbered.**
Repeat Step 2 until all events are numbered.

Earliest Event Time Algorithm

Step 1: Let $E(0) = 0$.
Step 2: For j = 1,2,3,...,n (where n is the last event), let
$E(j) = \text{maximum } \{E(i) + D_{ij}\}$
where the maximum is computed over all activities (i,j) that have j as the ending event.

Latest Event Time Algorithm

Step 1: Let L (n) equal the required completion time of the project.
Note: L (n) must equal or exceed E(n).
Step 2: For i = n-1, n-2... 0, let
$L(i) = \text{minimum } \{L(j) - D_{ij}\}$
where the minimum is computed over all activities (i,j) that have i as the starting event.

The earliest event time algorithm computes the earliest possible time, E(i), at which each event, i, in the network can occur. Earliest event times are computed as the maximum of the earliest start times plus activity durations for each of the activities immediately preceding an event. The earliest start time for each activity (i,j) is equal to the earliest possible time for the preceding event E(i):

$$ES(i,j) = E(i)$$

The earliest finish time of each activity (i,j) can be calculated by:

$$EF(i,j) = E(i) + D_{ij}$$

Activities are identified in this algorithm by the predecessor node (or event) i and the successor node j. The algorithm simply requires that each event

in the network should be examined in turn beginning with the project start (node 0).

The latest event time algorithm computes the latest possible time, L (j), at which each event j in the network can occur, given the desired completion time of the project, L (n) for the last event n. Usually, the desired completion time will be equal to the earliest possible completion time, so that E (n) = L (n) for the final node n.

The procedure for finding the latest event time is analogous to that for the earliest event time except that the procedure begins with the final event and works backwards through the project activities. Thus, the earliest event time algorithm is often called a *forward pass* through the network, whereas the latest event time algorithm is the *backward pass* through the network. The latest finish time consistent with completion of the project in the desired time frame of L(n) for each activity (i,j) is equal to the latest possible time L(j) for the succeeding event:

$$LF(i,j) = L(j)$$

The latest start time of each activity (i,j) can be calculated by:

$$LS(i,j) = L(j) - D_{ij}$$

The earliest start and latest finish times for each event are useful pieces of information in developing a project schedule. Events which have equal earliest and latest times, E(i) = L(i), lie on the critical path or paths. An activity (i,j) is a critical activity if it satisfies all of the following conditions:

$$E(i) = L(i)$$

$$E(j) = L(j)$$

$$E(i) + D_{ij} = L(j)$$

Hence, activities between critical events are also on a critical path as long as the activity's earliest start time equals its latest start time, ES(i,j) = LS(i,j). To avoid delaying the project, all the activities on a critical path should begin as soon as possible, so each critical activity (i,j) must be scheduled to begin at the earliest possible start time, E(i).

Example: Critical path scheduling calculations

Consider the network shown in Figure 10-4 in which the project start is given number 0. Then, the only event that has each predecessor numbered is the successor to activity A, so it receives number 1. After this, the only event that has each predecessor numbered is the successor to the two activities B and C, so it receives number 2. The other event numbers resulting from the algorithm are also shown in the figure. For this simple project network, each stage in the numbering process found only one possible event to number at any time. With more than one feasible event to number, the choice of which to number next is arbitrary. For example, if activity C did not exist in the project for Figure 10-4, the successor event for activity A or for activity B could have been numbered 1.

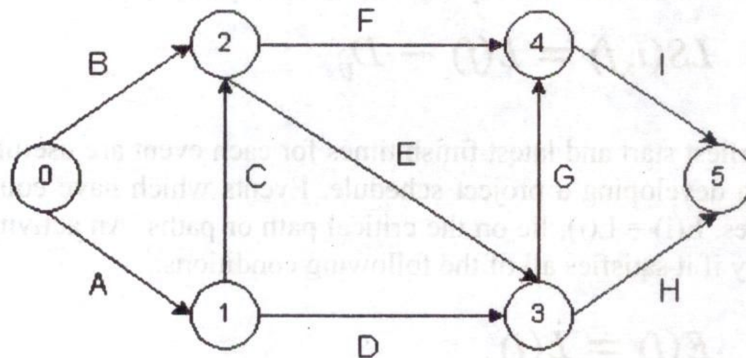


Figure: A Nine-Activity Project Network

Once the node numbers are established, a good aid for manual scheduling is to draw a small rectangle near each node with two possible entries. The left hand side would contain the earliest time the event could occur, whereas the

right hand side would contain the latest time the event could occur without delaying the entire project.

Precedence Relations and Durations for a Nine Activity Project Example

Activity	Description	Predecessors	Duration
A	Site clearing	---	4
B	Removal of trees	---	3
C	General excavation	A	8
D	Grading general area	A	7
E	Excavation for trenches	B, C	9
F	Placing formwork and reinforcement for concrete	B, C	12
G	Installing sewer lines	D, E	2
H	Installing other utilities	D, E	5
I	Pouring concrete	F, G	6

For the network in Figure 10-4 with activity durations in Table 10-2, the earliest event time calculations proceed as follows:

Step 1 → $E(0) = 0$

Step 2

j = 1 → $E(1) = Max\{E(0) + D_{01}\} = Max\{ 0 + 4 \} = 4$

j = 2 → $E(2) = Max\{E(0) + D_{02}; E(1) + D_{12}\} = Max\{0 + 3; 4 + 8\} = 12$

j = 3 → $E(3) = Max\{E(1) + D_{13}; E(2) + D_{23}\} = Max\{4 + 7; 12 + 9\} = 21$

j = 4 → $E(4) = Max\{E(2) + D_{24}; E(3) + D_{34}\} = Max\{12 + 12; 21 + 2\} = 24$

j = 5 → $E(5) = Max\{E(3) + D_{35}; E(4) + D_{45}\} = Max\{21 + 5; 24 + 6\} = 30$

Thus, the minimum time required to complete the project is 30 since E(5) = 30. In this case, each event had at most two predecessors.

For the "backward pass," the latest event time calculations are:

Step 1 → L(5) = E(5) = 30

Step 2

j = 4 → L(4) = Min {L(5) - D_{45}} = Min {30 - 6} = 24

j = 3 → L(3) = Min {L(5) - D_{35}; L(4) - D_{34}} = Min {30 -5; 24 - 2} = 22

j = 2 → L(2) = Min {L(4) - D_{24}; L(3) - D_{23}} = Min {24 - 12; 22 - 9} = 12

j = 1 → L(1) = Min {L(3) - D_{13}; L(2) - D_{12}} = Min {22 - 7; 12 - 8} = 4

j = 0 → L(0) = Min {L(2) - D_{02}; L(1) - D_{01}} = Min {12 - 3; 4 - 4} = 0

In this example, E(0) = L(0), E(1) = L(1), E(2) = L(2), E(4) = L(4),and E(5) = L(5). As a result, all nodes but node 3 are in the critical path. Activities on the critical path include A (0,1), C (1,2), F (2,4) and I (4,5) as shown in Table 10-3.

Identification of Activities on the Critical Path for a Nine-Activity Project

Activity	Duration D_{ij}	Earliest start time E(i)=ES(i,j)	Latest finish time L(j)=LF(i,j)	Latest start time LS(i,j)
A (0,1)	4	0*	4*	0
B (0,2)	3	0	12	9
C (1,2)	8	4*	12*	4
D (1,3)	7	4	22	15
E (2,3)	9	12	22	13
F (2,4)	12	12*	24*	12
G (3,4)	2	21	24	22
H (3,5)	5	21	30	25
I (4,5)	6	24	30*	24

*Activity on a critical path since E(i) + D_{iJ} = L(j).

Activity Float and Schedules

A number of different activity schedules can be developed from the critical path scheduling procedure described in the previous section. An *earliest time* schedule would be developed by starting each activity as soon as possible, at ES(i,j). Similarly, a *latest time* schedule would delay the start of each activity as long as possible but still finish the project in the minimum possible time. This late schedule can be developed by setting each activity's start time to LS(i,j).

Activities that have different early and late start times (i.e., ES(i,j) < LS(i,j)) can be scheduled to start anytime between ES(i,j) and LS(i,j) as shown in Figure 10-6. The concept of *float* is to use part or all of this allowable range to schedule an activity without delaying the completion of the project. An activity that has the earliest time for its predecessor and successor nodes differing by more than its duration possesses a window in which it can be scheduled. That is, if $E(i) + D_{ij} < L(j)$, then some float is available in which to schedule this activity.

Float is a very valuable concept since it represents the scheduling flexibility or "maneuvering room" available to complete particular tasks. Activities on the critical path do not provide any flexibility for scheduling nor leeway in case of problems. For activities with some float, the actual starting time might be chosen to balance work loads over time, to correspond with material deliveries, or to improve the project's cash flow.

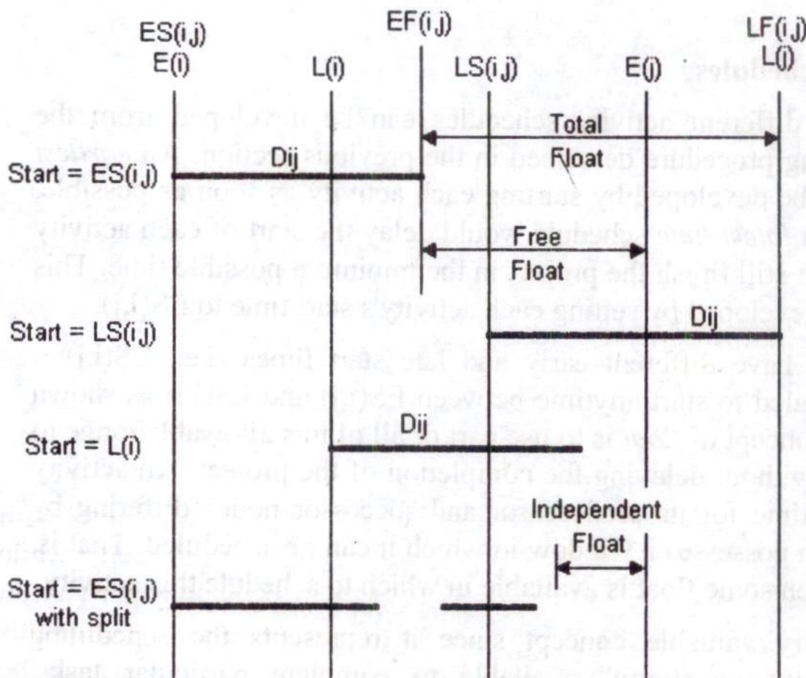


Figure: Illustration of Activity Float

Of course, if one activity is allowed to float or change in the schedule, then the amount of float available for other activities may decrease. Three separate categories of float are defined in critical path scheduling:

Free float is the amount of delay which can be assigned to any one activity without delaying subsequent activities. The free float, FF(i,j), associated with activity (i,j) is:

$$FF(i,j) = E(j) - E(i) - D_{ij}$$

Independent float is the amount of delay which can be assigned to any one activity without delaying subsequent activities or restricting the scheduling of preceding activities. Independent float, IF(i,j), for activity (i,j) is calculated as:

$$IF(i,j) = \begin{cases} 0 \\ E(j) - L(i) - D_{ij} \end{cases}$$

Total float is the maximum amount of delay which can be assigned to any activity without delaying the entire project. The total float, TF(i,j), for any activity (i,j) is calculated as:

$$TF(i,j) = L(j) - E(i) - D_{ij}$$

Each of these "floats" indicates an amount of flexibility associated with an activity. In all cases, total float equals or exceeds free float, while independent float is always less than or equal to free float. Also, any activity on a critical path has all three values of float equal to zero. The converse of this statement is also true, so any activity which has zero total float can be recognized as being on a critical path.

The various categories of activity float are illustrated in Figure 10-6 in which the activity is represented by a bar which can move back and forth in time depending upon its scheduling start. Three possible scheduled starts are shown, corresponding to the cases of starting each activity at the earliest event time, E(i), the latest activity start time LS(i,j), and at the latest event time L(i). The three categories of float can be found directly from this figure. Finally, a fourth bar is included in the figure to illustrate the possibility that an activity might start, be temporarily halted, and then re-start. In this case, the temporary halt was sufficiently short that it was less than the independent float time and thus would not interfere with other activities. Whether or not such work splitting is possible or economical depends upon the nature of the activity.

As shown in Table activity D(1,3) has free and independent floats of 10 for the project shown in Figure 10-4. Thus, the start of this activity could be scheduled anytime between time 4 and 14 after the project began without interfering with the schedule of other activities or with the earliest completion time of the project. As the total float of 11 units indicates, the start of activity D

could also be delayed until time 15, but this would require that the schedule of other activities be restricted. For example, starting activity D at time 15 would require that activity G would begin as soon as activity D was completed. However, if this schedule was maintained, the overall completion date of the project would not be changed.

BENEFITS

The benefit of using CPA is

- Critical Path Analysis is that it helps you to identify the minimum length of time needed to complete a project
- Identifies which tasks can be delayed for a while if resource needs to be reallocated to catch up on missed tasks.
- This helps you to minimize cost while still achieving your objective

DEMERITS

There are drawbacks of this technique, as estimations are used to calculate times:

- If one mistake is made, the whole analysis could be flawed, causing major upset in the organisation of a project.
- The relation of tasks to time is not as immediately obvious as with Gantt Charts. This can make them more difficult to understand for someone who is not familiar with the technique

CONCLUSION

The results from this method allow managers to prioritize activities for the effective management of project completion. Originally, the critical path method considered only logical dependencies between terminal elements. Since then, it has been expanded to allow for the inclusion of resources related to each activity. This capability allows for the exploration of a related concept called the critical chain, which determines the project duration from both time and resource dependencies.

Since project schedules change on a regular basis, CPM allows continuous monitoring of the schedule, allows the project manager to track the

critical activities, and ensures that non-critical activities do not interfere with the critical ones. In addition, the method can easily incorporate the concepts of stochastic predictions, using the Program Evaluation and Review Technique (PERT) and event chain methodology.

Currently, there are several software solutions available in industry that use the CPM method of scheduling, see list of project management software. However, the method was developed and used (for decades) without the aid of computers (with pencil and paper).

Self Assessment Questions

1. What is PER? State its conventions.
2. Explain the basic terminologies of PERT programme.
3. Draw a PERT diagram aking into account the specifications of your choice for constructing a Hotel indusry.
4. Discuss the importance of monitoring? State its methods also.
5. What are slacks and floats in drawing network diagram?
6. Describe the process, merits and demerits of applying CPM in any category of tourism industry.

* * *

UNIT VI

PROJECT EVALUATION

Introduction

Project evaluation is an important aspect in the process of planning. Every socio-economic programmes needs to be assessed for its results. One can say that the need for and importance of review of planned programmes was realised and stressed along with the initiation of the planning exercise itself.

Evaluation is an important tool to identify the shortcomings during the entire implementation period and to develop or initiate corrective actions to improve the delivery and administrative purposes. Such studies answer questions like: whether the project is implemented in the ways specified; whether the methods, process, procedures etc. adopted are appropriate to achieve the set goal; whether the personnel are sufficiently motivated, trained and adequate for the success of the project. Similarly, the project evaluation studies are conducted for assessing the impact of the project and also to examine the project efficiency.

PROJECT APPRAISAL

Project appraisal is a tricky issue, as one has to assess the project submitted by the NGO to the funding agency. This requires great technical and subject knowledge so probably we would not fit in that, but we can obviously help the technical consultant in doing an organisational vetting and appraising their financial proposals.

Execution of the Project

Guidance of project Implementation

Execution of the project is the real task that the NGO has to perform to first show its caliber to the society and secondly the project actually gives the NGO to achieve its objectives of formation, mission and vision. If we go through the project execution history of the NGOs, we will see that apart from the corrupt NGOs, who do not do any work, we will see that project execution is going on more or less as per the agreement / MOU / proposal. Execution of a project is a tedious task and has to be done meticulously. It is team effort and here we can play a role in various capacities. To start with, we can guide the

NGO in developing systems for the project, work plans, developing understanding, financial management, freezing the budget, etc. So, with the start of the project, work starts and there are many avenues where we have a niche and can create a sector for ourselves.

Monitoring as an important tool to assess the execution of projects and also assess the capability of the NGO. Till today maximum people who do monitoring are basically people having asocial background. But, the place where they are weak is in financial monitoring. The current batches of monitoring agencies are although good in technical monitoring are weak in financial management. The programmes being implemented are although monitored technically, but financial monitoring goes sometime unattended. Thus monitoring with the expertise a CA has, would go a long way in helping out the funding agencies and Government in responsive monitoring. This can also be a good opportunity where the monitor assesses the capacity building needs of the NGO and gives regular inputs to the funding agencies for capacity building programmes of the NGO.

Thus the role, function, objective and purpose of Project Review is not only to help, guide, direct and aid the planners, project sponsors, policy formulators but also help the administrators, executives, scholars and academicians. In review, the most fundamental task is the formulation of criteria of review and also determination of the time for the study. On the basis of these criteria of Review and also determination of the time for the study. On the basis of these criteria the results or outcome of the projects are assessed.

Review/Evaluation process essentially involves some important steps viz. Data collection, estimation of cost benefits and profitability of the project and comparing it with the required rate of return to decide acceptance or non acceptance of the project. Data collection may be made both from secondary sources or published documents viz. company balance sheets, government publications, publications of independent research bodies or industrial associations as well as from primary sources like the industry and market.

Once the data is collected, it is necessary to shift the same for eliminating the irrelevant and retain only the significant information. On the basis of the data collected and collated an estimate may be prepared of the cost of the project starting from cost of the land and building and going through elements like cost of plant going through elements like cost of plant and machinery, duties and

taxes, working capital needs, estimated pre-operative expenses and contingencies to arrive at an estimate of total cost of the project.

Once the cost of the project is estimated, it is necessary to make certain assumption as regards the schedule of implementation, capacity build-up of production, cost of raw material, other related costs, realisable selling prices etc. in order to arrive at the returns and the profitability of the project.

A comparison of the estimated and required profitability will form the basis of selection or rejection of the project. What constitutes estimated/required profit ability? It really depends on the nature and focus of project evaluation.

Project review is the final phase of Project Management. The various facets of Project review are

- Initial review
- Performance evaluation
- Abandonment analysis
- Behavioural issues in project abandonment
- Administrative aspects of capital budgeting
- Evaluating the capital budgeting system of an organisation.

INITIAL REVIEW

It is the first stage in the project review process. The initial review of a project is of two types:

- Control of project in progress
- Post audit

Control of Project in Progress

The expenditure authorisation for a project generally specifies how much can be spent by whom and when. To ensure that the actual expenditure does not deviate significantly from the authorised expenditure, periodical control is exercised during project implementation.

Post audit

An audit of a project after it has been commissioned is referred to as post audit or post completion audit. Most firms do a post audit for almost every project above some threshold limit. Such an audit compares actual performance vis-a-vis planned performance when the operations of the project stabilise.

Performance Evaluation

While the post audit is typically a one-time exercise, performance evaluation is done periodically. It seeks to measure the performance of the project on an ongoing basis.

Performance evaluation may be done in terms of economic rate of return or book return on investment.

$$\text{Economic rate of return for a given year} = \frac{\text{Cash flow} + \text{Changes in present value}}{\text{Present value at the beginning of the year}}$$

$$\text{Book return rate of return for a given year} = \frac{\text{Cash flow} + \text{Changes in book value}}{\text{Book value at the beginning of the year}}$$

Abandonment analysis

Ordinarily a project is analysed on the assumption that the firm will operate it for a given period. Often, however, it may be possible to abandon the project before this period. This possibility of abandonment, when considered explicitly in project analysis, may change the decision itself. A detailed discussion about this analysis is given in the project control techniques paper. (Please refer).

A basic rule of capital budgeting says that investment decisions should be guided by the net present value criterion. Applied to a project 'continuation versus abandonment' decision, this rule says the project must be abandoned if

the net present value associated with abandonment is greater than the net present value associated with continuation is greater than the net present value associated with abandonment.

Administrative aspects of capital budgeting

The discussion of administrative aspects of capital budgeting has been organised as follows:

- identification of promising investment opportunities
- classification of investments
- submission of proposals
- decision making
- preparation of capital budget and appropriation
- implementation
- performance review

The relationship between the firm and its environment should be regularly analysed, corporate plans and perspectives must be widely shared, and the creativity and imagination of the employees must be tapped. To generate ideas, suggestion schemes are usually recommended.

Classification

The classification of project proposals refer to the grouping of similar proposals into separate categories. Classification helps in decision making, budgeting, and control.

Submission of proposals

To ensure that all relevant information for proposals is gathered systematically, a standardised proposal form may be used by all the sponsors of investment projects.

The proposal form before it reaches the capital budgeting committee should normally be routed through persons who can comment on the estimates furnished by the sponsor. The routing channel, however, cannot be standardised. It will vary from one organisation to another and, perhaps, from one proposal to another.

Routing a proposal through several persons provides a mechanism for obtaining the views and judgements of others. This also facilitates coordination

of inter-related activities. Obviously this system would yield benefits only when the persons through whom the proposal is routed give thought to it rather than merely forward it in a routine manner.

Decision Making

The optimal capital budget for the firm as a whole can be drawn up only when capital investment decisions are completely centralised. In most cases, decentralisation is required to facilitate quick decisions, develop executives, and conserve top management time for important matters. That is why most of the companies empower executives at different levels to take investment decisions involving outlays up to certain limits.

Preparation of Capital Budget and Appropriation

Smaller projects which can be approved at lower levels may be covered by a blanket appropriation so that they can be undertaken expeditiously. Projects of larger magnitude may be included after approval in the tentative capital budget. The final capital budget, which serves as the basis of budgetary appropriations, should be drawn up after the availability of funds is ensured. Often careful planning of funds is required before budgetary appropriations are made.

Implementation

Delays in implementation and consequent increases in project cost are very common. In many cases over-runs have been between 30 per cent and 100 per cent. These facts emphasise the need for expeditious implementation at a reasonable cost. For this the following points are helpful:

- Adequate formulation of projects
- Use of the principle of responsibility accounting
- Use of network techniques
- Exercise of proper control

Performance Review

Performance review is meant for evaluating actual performance vis-a-vis projected performance. It is concerned with the verification of assumptions regarding both revenues and costs.

REVIEW PROCESS

Project can be reviewed in different dimensions. Essentially it has to be evaluated from the marking technical, financial and commercial (Profitability) dimensions. Let us discuss briefly all these dimensions of project review.

Financial Review

The financial reviews seek to determine the:

1. Reasonableness of the estimate of capital cost.
2. Reasonableness of the estimate of working results.
3. Adequacy of the rate of return.
4. Appropriateness of the financing pattern.

Reasonableness of the Estimate of Capital Cost:

While assessing the capital cost estimates efforts are made to ensure that:

i) Padding or under-estimation of costs is avoided.
ii) Specification of machinery is proper.
iii) Proper quotations are obtained from potential suppliers.
iv) Contingencies are provided and
v) Inflation factors are considered.

Reasonableness of the Estimate of working results: the estimate of working results is sought to be based on:

i) A realistic market demand forecast
ii) Price computations for inputs and outputs that are based on current quotations and inflationary factors.
iii) An appropriate time schedule for capacity utilisation and
iv) Cost projections that distinguish between fixed and variable costs.

Adequacy of Rate of Return: The general norms for financial desirability are as follows:

1.	Internal rate of return	:	15 per cent
2.	Return on investment	:	20-25 per cent
3.	Debt-service coverate ratio	:	1.5 to 2.0

In applying these norms, however a certain degree of flexibility is shown on the basis of the nature of the project, the risks inherent in the project and the status of the promoter. Appropriateness of the Financing Pattern:-

The institutions consider the following in assessing the financial pattern:

1. A general debt equity ratio norm of 2:1
2. A requirement that promoters should contribute 15% to 20% of the project cost.
3. Stock exchange listing requirements
4. The means of the promoter and his capacity to contribute a reasonable share of the project finance.

Financial review: Two aspects in our discussions of financial review, two questions need to be answered:

1. How financial institutions define the cash flow stream?
2. How financial institutions calculate the debt service coverage ratio?

Cash flow stream

Among the three methods of assessing cash flow stream. The total funds point of view method from which a project may be evaluated and defined the measures of cash flow stream applicable to these points of view.

Financial institutions view a project from the total funds point of view. Let us see how the cash flow stream defined by them compares with the cash flow stream applicable to the total funds point of view.

	Cash flow stream defined by financial institutions	***Cash flow stream (total funds of view method)***
1. Initial flow	Outlay on fixed assets plus current assets depreciation	Outlay on fixed assets plus current assets
2. Operating flow	Earnings before interest and taxes	Profit after tax + Depreciation + interest on short term borrowings (1-tax rate) + interest on term loans (1-tax rate)

3. Terminal flow	Residual value of assets + realisable value of current assets	Net salvage value of fixed assets + net salvage value of current assets.

Comparing the cash flow streams given above, we find that:

a. The initial flow is defined identically in both the cases

b. The operating flow is defined in pre-tax terms by the financial institutions.

c. The terminal flow is defined in both the cases as the sum of

i) the residual value of fixed assets and

ii) the realisable value of current assets.

However the procedures of estimation seem to be different financial institutions, typically define the residual value of fixed assets as equal to 5 per cent of the initial cost for non-depreciable assets. Clearly no explicitly effort is made to estimate the likely salvage values at the end of the economic life and the tax liability thereon as part of an exercise to establish the net salvage value. Likewise, the realisable value of current assets is typically put as equal to its par value. This procedure x is simple and obviates the need to consider the effect of tax factor.

Debt Service Coverage Ratio: The debt service coverage ratio(DSCR) has been defined as

The calculation done by the financial institutions is however slightly different. In their calculation the DSCR of each year is determined separately and then the arithmetic average of these yearly DSCR is taken. In symbols, the overall DSCR as calculated by the financial institutions is as follows:

It may be noted that the DSCR, as calculated by the financial institutions is either to or greater than the DSCR as calculated by Eq. A given above. Refinements in Financial Evaluation:

The financial evaluation that is presently done may be strengthened by a systematic analysis of risk and inflation.

Risk analysis: The ten year projection and subsequent analysis based on them is done under a single set of assumptions. In view of the risks characterising

investment projects it is advisable to look at the possible variations in the key factors and examine their impact on profitability. For this purpose, the techniques of sensitivity analysis and scenario analysis should be employed routinely. In addition, the technique of montre earlo simulation may be employed for projects involving substantial commitments and considerable risks.

Inflation analysis: Typically, financial projections are based on current prices/costs. Implicit in this procedure is the assumption to move in random. Where different inflation rates are applicable to various items of revenues and costs, the same should be explicitly incorporated in financial evaluation.

Better monitoring: While Project Monitoring and control is done reasonably during the implementation stage, it is done less effectively during the operational stage. This may be because of lack of adequate personnel and should monitor the needs of a large number of projection a continuing basis. Given the importance of monitoring and control during the operational stage it may be necessary to

a) augment the manpower engaged in this task.
b) computerise the monitoring routines
c) design check lists which focus sharply on critical areas
d) develop sound remedial measures to cope with sickness right in the incipient stage and
e) review the monitoring procedures periodically to strengthen them.

Technical Review

The technical review done by the financial institution focuses mainly on the following aspects.

1. Project mix
2. Capacity
3. Process of manufacture
4. Engineering know-how and technical collaboration
5. Raw materials and consumables
6. Location and site
7. Building
8. Plant and equipments
9. Break-even point

The technical review is done by qualified and experienced personnel available in the institutions and/or outside experts (particularly where large and technologically sophisticated projects are involved).

Marketing Review

The importance of potential market and the need to develop a suitable marketing strategy cannot be over-emphasised. Hence efforts are made to:

1. Examine the reasonableness of demand projections by utilising the findings of available surveys, industry association projections, planning commission/DGTD projections and independent market surveys (which may sometimes be commissioned)
2. Assess the adequacy of marketing arrangements in terms of promotional effort, distribution, network, transport, facilities, stock levels etc.
3. Judge the knowledge, experience and competence of key marketing personnel.

Marketing Review: In order to judge the managerial capability of the promoters, the following questions are raised.

1. How resourceful are the promoters?
2. How sound is the understanding of the project by the promoters?
3. How committed are the promoters?

Resourcefulness: This is judged in terms of the prior experience of the promoters the progress achieved in organising various aspects of the project and the skill with which the project is presented.

Understanding: This is assessed in terms of the credibility of the project plan (this includes, inter alia, the organisation structure, the estimated costs, the financing patterns, the assessment of various inputs and the marketing programme) and the details furnished to the financial institutions.

Commitment: This is gauged by the resources (financial, managerial, material and other) applied to the project and zeal with which the objectives of the project. Short-term as well as long-term and pursued.

Managerial review also involves an assessment of the calibre of the key technical and managerial personnel working on the project, the schedule for training them and the remuneration structure for rewarding and motivating them.

Economic Review

The economic review looks at the project from the large social point of view. The methodology adopted by the financial institutions for the purpose of economic evaluation is labelled as "Partial little Mirrlees" approach. In addition to the calculation of economic rate of return as per this approach, they also look into two other economic indicators viz.

Effective rate of protection and Domestic resource cost

The economic review done by the financial institutions is not very rigorous and sophisticated. Also the emphasis place on this review is rather limited. So, it is essential to give increased emphasis and improved methodology for vital aspect of project review.

Project Evaluation by World Bank

The World Bank evaluation of project includes all the above factors. Additional special features which are covered by the World Bank in evaluation of the project are given below.

1. World Bank places considerable emphasis, particularly in the world countries, about the availability of infrastructure in the supporting facilities. While evaluating the projects they generally insist on complete arrangement of infrastructure facilities and commitments in this regard from the concerned authorities. This includes the proper arrangement for water, electricity, availability, arrangement of the raw material, fees stocks, pollution control arrangements, transport arrangement including railway siding etc. wherever required.

2. Project management capabilities of the team in charge of the project is also one of the important considerations reviewed by the appraisal terms. They in fact go into the bio-data and the other details of the key persons and sometime put conditions for a suitable persons to look after the aspects of the project where they feel that the management aspect is weak.

3. Besides the technical feasibility of the project, the World Bank put some emphasis of the marketing arrangement and the marketing feasibility of the project. This is a fact that normally the project which is technically feasible would come up and start functionship but the marketing arrangements are major cause of failure of the projection case either there is no demand or the

project is unable to compare with its competitors in market. The World Bank reviews the production capacities available in the marketing area. The marketing network proposed by the projects as well as marketing set-up is thoroughly reviews to ascertain the adequacy of marketing arrangements even at the stage of project appraisal.

4. The world Bank also reviews the working capital arrangement of the project in detail to ensure that the project has adequate arrangement of working capital for operation and does not lack working capital.

5. Other important aspects which the World Bank reviews is the economic analysis of the project. The project is not supported by the World Bank, if it does not have a proper economic rate of return. The economic analysis considers the benefits of the project not to the project corporation but to the nation as a whole. The project is taken up by the World Bank for financing only in case the economic rate of return is favourable.

Requirements for Proper Evaluation:

There are varied opinions about the requirements for adequate evaluation. So, the project can be evaluated under the following conditions.

1. Clear statement of the goals and objectives
2. Agreed upon criteria for assessing objectives
3. Project targets are explicit and measurable
4. Intervention or treatment is explicit

EVALUATING THE PROJECT MANAGEMENT OF AN ORGANISATION

The soundness of the project management system of an organisation may be evaluated in terms of the following criteria:

Results	Are the results of the capital budgeting system consistent with the goals of the organisation?
Techniques	Are efficient techniques being employed for purposes of capital expenditure planning, decision making and control?
Communication	Are the premises underlying capital budgeting com--municated to those who participate in this process?

Decentralisation	Is there meaningful delegation and decentralisation which permits decision making at appropriate levels?
Intelligibility	Are the policies, methods of analysis, and procedures understood by different segments of the organisation which are involved in capital budgeting?
Flexibility	Does the system have sufficient flexibility to respond to the dynamic changes in the environment and to permit variations in approaches for projects with differing characteristics?
Control	Are adequate controls being exercised in the implementation phases to ensure that slippages are mitigated?
Review	Is there a systematic review of capital investments which permits meaningful feedback for improving the system and its effectiveness?

PERFORMANCE AND IMPROVEMENT

Ideally, a project will be considered totally successful, if it gets completed on time, within the budget and performs exactly to the designer's specifications. But this is tall order and many projects would not meet these requirements.

A project is considered to be a total failure if it is abandoned half-way; if it is not producing expected quality of product and if it becomes sick soon after going into commercial production.

In real life, a project cannot be considered either a total success or a total failure- it would fit somewhere in-between. Here, the project manager or investor must keenly watch how the project is being managed when it is in progress.

Time and cost overruns are the most commonly used indicators of project performance. Well managed project could be completed with minimum of time and cost overruns.

The ratio of output to the cost incurred is achieving project objectives is also an indicator of project performance.

Productivity is also an indicator of performance which states that how resources have been utilised either for production of goods and services or for creation of facilities for the same.

Consideration of value is essential for improving project management performance. Value, which can be expressed as performance, improves only when performance is achieved as at no extra cost or when cost can be reduced for the desired level performance.

Do-it-yourself Trap

Cost is the prime factor relating the project management performance. Many people would feel to do everything themselves to bring down cost. This sort of thinking often results in the owner trying to do a project all on his own. Owners use to engage a team to manage his project, engage labour contractors for construction and supervise the design, procurement and construction work all by himself. This policy maximises the time and cost overrun. It imposes a heavy load of co-ordination on a working group. The cost of having enough experience outweighs any apparent advantage in one's handling the project all on one's own.

Turn-key Trap

Those who don't have adequate expertise, often decide to use the turn-key approach for efficient execution of a project. The owner expects that, the turn-key contractor can take care of all the troubles of project execution and hand over the key to the owner, when the plant is ready for operation. Some people believe that, this is the surest way to complete the project not only in the shortest possible time but also at least cost. But, the lessons from turn-key contract say that, if the owner does not select the right contractor, there will be no end of trouble for him.

The CM and DM companies

The owner, when he is not doing things himself, needs someone who is not working for profit. These are the CM(Construction Management) and DM (Design Management) companies. These companies work as the owner's agents for a fee and have only the owner's interest uppermost in mind. They do not gain any profit from the sale of hardware; they earn a fee from the sale of their services and their fee represents a small percent of the project cost. As owner's

interest is, therefore, likely to be best sewed and the project cost is likely to be the lowest, when the project is handled by a competent CM or DM company.

Evaluation of the Project

Evaluation is quiet different form Monitoring because, monitoring is an on-going process but evaluation is after a certain time say mid-term evaluation, end-term evaluation, etc. Monitoring is done for outputs but evaluation is done for the outcomes. The role we can play in Evaluation studies can be assessing the impact of a particular style of funding in an issue and analyzing it to find out the cost-benefit analysis, return on investment, etc. These terms are although used in a commercial context, but can also be applied in the social sector, e.g. evaluation can be done for funding to a particular area and finding out its impact on the increase in per capita income of the people, if the project targets increasing the income levels of the people.

Governance

Governance is a major issue in the sector. Many of the NGOs lack of basic framework of Governance e.g. Boards of NGOs having family members, no audit and purchase committees, etc. With our own Corporate Governance in place, we can put the customized framework in place for these NGOs and help them in Good Governance. Governance also includes setting up systems for programme implementation and monitoring, setting up systems for meetings and documentation and implementation of the decisions, systems for financial management, etc. are all part of Good Governance. We can help the NGOs in setting up systems and their implementation also.

PERCENTAGE PROGRESS TECHNIQUE

A common approach that is adopted to assess the progress of the project is to review the percentage of physical work completed and the percentage of project outlay effected. The Project gets split into several designated and discrete activities. Each activity is assigned certain 'units', on the basis of engineering and/or cost considerations, which serve as weights representing the relative volume of works or proportion of costs. The progress in each activity, estimated in percentage, and multiplied by the relevant value in terms of units, can then be aggregated to indicate the overall physical or financial progress, as the case may be.

The advantage of this technique is that it is simple and easy to comprehend. But, its drawback lies in the oft-found tendency to manipulate figures to show the progress that is not there.

Several are the instances where everything seems to go very well for most part of the project and towards the final stages of the project, there is a sudden slowing down of pace or stagnation. This is referred to as 'the 95% syndrome'. The co-ordination failures and other deficiencies come to surface at this culminating stage, where a long wait is involved in commissioning the project.

One way to sharpen the physical progress percentage technique is to exclude, for purposes of computing percentage of progress, the unscheduled activities that have been incorporated in the project. Even with this refinement, this technique cannot be considered to be a very effective tool for project planning and monitoring.

Where the different activities of the project have interdependencies, overall percentage of progress has no meaning, as certain minor but critical activities might hold up progress for extended periods, particularly during the final phases, and affect the viability of the project.

Objective-Oriented Project Planning

Reviews to examine slippages in project implementation tend to have a misplaced focus on fixing the blame for the delays rather on devising ways of resolving attendant problems promptly and ensuring speedy execution of the project. The project team should be actively involved in participative action planning instead of merely going through the motions of a chart drawing exercise. The German Wing for Technical Cooperation has been using, with reference to its overseas assisted projects, a technique known as ZOPP, which in effect is 'Objectives-oriented Project Planning'.

Project Management, in Indian situation, has to take note of a host of uncertainties that can upset initial anticipations and assumptions, and necessitate resolving field problems that may crop up mid-way through implementation. It is, therefore, essential that the implementing team is closely associated with the detailed working in the planning phase.

(i) **Participation Analysis:** This is a identify the persons, groups, organisations and institutions of significance to the project and to ascertain their interests and expectations. The stakeholders of the project

get identified, and their rights and obligations are brought into focus so that the project team is aware of the responsibility to the diverse people interested in the successful functioning of the project, such as the customers, suppliers, employees, shareholders and the community or the targeted beneficiaries. The understanding of the extend of interface and co-ordination needed with external agencies for the prompt implementation of the project helps in initiating the necessary steps to obtain their timely co-operation.

(ii) **Problem Analysis:** While examining the problems that are likely to be encountered during the implementation phase of the project, the individual members of the project team tend to have their own biased or narrow perceptions confined to their respective areas of discipline or specialisation. What is required, on the other hand is an analysis of the environmental factors that can give rise to problem situations, the identification of the major problems in this context, an agreed definition of the core problem arrived at after detailed discussions between the members of the project team and the visualisation of the related cause and effect relationships in the form of a Problem Tree. This systematic diagnostic process facilitates attention to the broader issues and enables the group to have a balanced view of problem dimensions and priorities. For instance, there could be undue obsession with overtime bills and aggressive measures may be thought of to curb the commitments in this regard, whereas there could be much more significant areas for cost reduction and productivity improvement initiatives with substantial benefits.

Development of the Problem Tree is a systematic diagnostic exercise, that helps in tracing the causes and effects attendant on the problem under consideration, and the relationships of these causes and effects. For example, sub-standard performance may be the consequence of:

- skill inadequacies;
- system inadequacies;
- co-ordination deficiencies;
- lack of team work;
- inept monitoring and feedback

The causes and the possible options to tackle them get considered in detail and, as a result, there is clarity of priorities and approaches.

(iii) **Objective Analysis:** The development of specific objectives to deal with the causative factors relating to the problems under scrutiny is the logical step that follows problem analysis. This ensures that the remedial actions are specific to the causative aspects of the identified problems. This is in contrast with the oft-found tendency to take general and tentative efforts to deal with symptoms, rather than identified causes.

(iv) **Planning Matrix:** Once the specific action plans are determined, it will also be necessary to develop indicators to measure the progress achieved in the concerned output areas. The Planning Matrix will make a summary presentation on the need for the project, its achievement expectations, the process of achieving the anticipated results, critical external factors, the information base and the mode of determining the success of the project and the cost of the project. This planning and action matrix eventually goes before the top management for review and approval.

Crashing

When the project completion time is a critical factor, efforts are made to shorten the critical path. Roof work may be started though the walls are only partially complete. With some protective measures, equipment installation may be commenced even when the walls and roof are getting ready. A larger workforce may be employed to complete the work faster. These steps to shorten the schedule could involve substantial additional expenditure. Larger workforce could lead to lesser efficiency due to crowding. These are efforts to 'buy time with money', and go by the name of crashing.

Crashing has to be resorted to after proper assessment of the cost implications, as sometimes crashing of certain items on the critical path can render other activities critical, with no ultimate benefit. At the same time, saving in project time will correspondingly reduce the time related costs such as supervision, field office costs, interest, etc., and hasten the process of gains from operations. Decisions on crashing thus involve a study of the trade-off between associated costs and gains.

Management Summary Reports

Cost and slippage are aspects on which the management would need to keep a constant vigil and the relevant periodic reports have therefore to be provided on a regular basis. These include:

(i) The cost overrun and underrun to date

This involves a comparison of the planned costs with actual costs for the work performed.

(ii) The projection of total cost overrun and underrun

This can be determined by comparing the original cost estimate with the actual costs to date plus the estimated costs to complete the project.

(iii) The amount of schedule slippage

This is given by the difference between the established schedule for project completion and the present expected date for project completion.

(iv) Final cost reports

The final cost reports give a summary of the final, officially confirmed project costs. In many instances, these reports do not get prepared. Once the project gets completed, the project team feels relieved of all tensions, and prefers to relax. The transactions in the finishing stages get overlooked for reporting purposes, and the final cost report fails to appear. Final cost reports, properly prepared, can serve as very valuable documents to guide future estimates.

CONCLUSION

Thus, the responsibility of the review authority lies in balancing judiciously different considerations for arriving at a proper decision. There can be readymade formulae, by using which a term loan proposal can be pronounced as acceptable or otherwise. Decision making in this area calls for full appreciation of all relevant factors and sound judgement based on experience.

PROJECT MANAGEMENT INFORMATION SYSTEMS

Project Management Information System is an information system through which the entire control information passes back and forth between the top management and those executives of middle and lower levels engaged in the project management. Project Management Information System is structured based on the needs of managerial planning and control activities and/or organisational functions. The Project Management Information System aims at providing information support to various levels of management in their decision making and control functions.

These functions are stated as follows:

- **Top Level management:** Information support for strategic planning at organisational level.
- **Middle level management:** Information support for decision making and project control at responsibility centre.
- **Lower level management:** Information support for transaction procession like resource productivity or activity progress status etc...

Project Management Information System should be capable of building a strong database for future need. It should be capable of meeting the entire need of the project with all sub-systems identified and integrated into the total system. It is the usual practice to store this information for some years, with updating method, all information crated in the organisation. Some of the information may be eliminated information system has different when all the likely users certify them as no longer required. A project management information system has different subsystems which fulfil information needs of management at different levels.

These subsystems are as follows:

- Decision support systems
- Management information systems
- Operating information systems

DECISION SUPPORT SYSTEMS (DSS):

Decision support systems shall provide the top management with exception reports that support decision making on vital issues. These reports

shall be mostly on the performance of semi structured and unstructured tasks that requirement management judgement. The exception reports sent to the top management need not necessarily be accompanied by detailed reports.

Decision support systems reports will give more of feed forward than feedback. Feedback is the factual information on the results of the past performance. Feed forward is the predicted likely information on the potential future performance, extrapolated at today's trend. The feed forward information will enable the top management to avert adverse conditions by taking timely preventive steps. The exception reports should therefore contain sufficient feed forward information. The prediction is a sort of feed forward. Contingency reports too are feed forward. A regular analysis of feed forward on potential deviations with reference to predicted causes will help in timely management decisions and preventing failures.

MANAGEMENT INFORMATION SYSTEMS (MIS):

The Management Information system (MIS) shall cover semi summarised reports on the semi structured tasks or project factors for the information and use of middle management personnel like the project team members and functional heads.

OPERATING INFORMATION SYSTEMS (OIS):

People at the operating level need a lot of data and information on structured tasks concerning their work area, to be able to carry out the work well by taking short term decisions and to feed information to their superiors. All the reports and basic data which form the database can be taken as operating information. They are detailed and numerous covering all the project variables.

ESSENTIALS OF PROJECT MANAGEMENT INFORMATION SYSTEMS:

Some of the essentials of project management information systems are discussed below

- A report on achievements and variances should be quite hitting.
- The report should contain the appropriate information with the required level of accuracy. The actuals and deviations should be brought immediately to the notice of the people responsible for performance and correction of variance.

- Instead of stating causes broadly it should strive to pinpoint root causes with accuracy and even suggest the possible preventive or corrective actions for management's consideration.
- The reports should be easily understandable and usable.
- The reports should contain feedback and feed-forward information on vital aspects.
- All reports should be factual and objective based on reliable data. They should not lead to unnecessary efforts on controlling insignificant variances. Control threshold be predetermined for various cost components.
- MIS and communication should be well coordinated so that all the information is carried and distributed effectively.
- DPMIS should elicit peoples involvement at all levels.
- The PIMS should not wait for deviations and disasters to happen but should predict their potential presence ahead so that the project can stay clear of them.

COMPUTER BASED INTEGRATED PROJECT MANAGEMENT INFORMATION SYSTEM (IPMIS):

In a large project with several work packages and thousands of activities to schedule, computer based IPMIS can contribute much to the projects management efficiency. Under such a system, project management planning and control are exercised with the help of computer packages which:

- Are easier to use and user-friendly
- Are flexible and can produce bar charts, main power plants, float chart etc..
- Store and manipulate data in a most convenient way.
- Can be integrated with database management information system.
- Identifies activities which are critical to finish the project on time.

The greatest benefit that a project team would derive from the computer base IPMIS is the information on project activities individually and with inter linkage. Reports can be had in the form of tables, bar charts, curves, network or

other diagrams. Summarises, exception reports and detailed statements can be predicted within minutes.

For the computer based IPMIS, the decision favouring installation of computers will depend on the size of the project, no of activities and the level of details desired to be usefully covered in the system. So far as the software requirement, in-house development of a software is time consuming and costly. There are many project management planning and control software's available in Indian market. The criteria for selection of software are: capacity, network notation, input features, editing features, output features, graphic output, language, and suitability with hardware, training requirements and any special requirement of the project. These criteria have to be listed and analysed with reference to the requirements of projects time, resources, cost and performance before suitable software is selected by the project management.

A few of the locally available software are listed below:

- PRISM - Tata Consultancy Services(TCS)
- Success planned! - TCS
- PROMIS - Integrated project management group (Indian agency)
- Project Management- Engineers India limited (EIL)
- PROMT - Bharat Heavy electrical Ltd. (BHEL)
- PERT/CPM - RITES
- SPEED - AICAM Consulting services
- PROMAN - M.N. Dastur and Co Ltd.
- PMS - IBM
- PCS - IBM
- PROJECT/2 - Software and development Inc.
- MSCS - Mc Donnel-Douglas

There are many other software packages on project management and control which can help the project manager as a support system. Besides the packages with the usual requirements, there are highly specialised systems which can be of great help depending upon the particular complexity and special need of a project. The computer-based IPMIS is becoming absolutely essential to a project manager as the knowledge of actuals may reveal when it is too late for

any course correction. It is more important to have the information analysed in a systematic manner and produced in a summarised and exception basis as quickly as possible. This need brings in the requirements of computer based IPMIS. But the system to be in use will depend upon the size, complexity and value of the project.

PROJECT AUDIT

Introduction:

Project audit and ex-post evaluation of projects are the techniques of performance evaluation and project control. These techniques are used with the purpose of measuring projects' effectiveness, efficiency and economy levels. This measurement is generally based on the answer to the following questions:

Effectiveness: Are the physical objectives achieved from the project comparable with the means provided and measures undertaken by the project?

Efficiency: Is the economic rate of return achieved by the project at least equal to what one expects to attain in other lines investment?

Economy: Are the investment and operating cost per unit reasonable in comparison with these costs for other similar projects in similar economic conditions?

IMPORTANCE OF PROJECT AUDIT

For several reasons, every project organization must employ a project audit system which functions independently and reports directly to the top management. Its aim should be and Independent evaluation of the total project control.

Project audit system in an organization may function either as a continuous audit system or a periodic audit system. When the project audit goes viz-a-viz project commissioning, it is in the nature of preventive audit and known as continuous project audit. On the other hand, audit of a project after it has been commissioned is in the nature of investigative audit and referred to as periodic audit, post audit or post completion audit.

A project audit is effective when it is a preventive rather than an investigative audit of the past performance although the data of past performance

may be used in the audit. In usual practice, most organizations perform a post audit for almost every project. Such an audit compares actual performance with the planned performance when the operations of a project stabilize.

When a project audit system audit system is introduced in an organization, it is for the top management to fix the terms of reference for audit from time to time or for project to project basis as per control requirements, but the general terms of reference for project audit should include the following:

- Schedule attainment of the objectives and project efficiency.
- Quality achievements.
- Cost budget achievements and economy in project implementation.
- Future implications of the present decisions and actions.
- Observance of plans, policies, practices and procedures.
- Identification of under utilizations, wastages and other losses.
- General prediction of potential problems.

Project audit in an organization will be able to check the manipulations, malpractices, pitfalls and even grave mistakes which may go unnoticed and even get repeated to the detriment of the project. In a situation, when all other system of control which run through various tiers of the organization and are anxious to show that they have not failed, the project audit will reveal their misleading 'colours' and 'distortions'. A continuous check through project audit on the observance of policies, practices and procedures will ensure management efficiency. The other benefits of a project audit system may include the following:

Helping in discovering systematic biases in judgment.

Providing a documented log of experience that may be valuable in improving future decision-making. Including healthy caution among project sponsors. Enabling the firm in identifying individuals with superior abilities in planning and forecasting. Serving as a useful training ground for promising executives who need broader business experience and exposure.

Project audit system should be in the charge of a very mature person who can perform his duties objectively and with dignity. Project auditor should be supported by an independent group consisting of executives drawn from different backgrounds-accountancy, marketing, engineering, planning and so on. The

project auditor and his team members should be educated in project objectives before they are put on project audit.

A periodic project audit may be performed when the project is just commissioned, when the operations of the project stabilize, when the project is terminated or at some other time in life of the project. Since the main objective of project audit is to draw lessons from experience and improve future decisions, the most suitable time for project audit is when the project operations stabilize. If project audit is conducted earlier than this, the review results may not be very meaningful and if it is conducted towards the end of the project life, the utility of the lessons drawn from such audit is likely to diminish.

It is necessary while conducting project audit that it covers the whole spectrum of control. No individual or functional group should resent the presence of the audit practice as long as they are informed that the project audit is a part of the organizational culture of the firm. The project auditor and his team members should not act as a fearsome specter, unnecessarily frightening the project executives to the point of demotivating them. While the real practitioners of corruption should know that they will be caught, the majority of the honest people should feel that the project auditor is a good guide and one who would tell them directly or through the top management at some point in time that they are performing their duties in the right manner.

INDUSTRIAL SICKNESS

The impact of industrial sickness on national economy is far-reaching. It leads to under-utilisation of capital assets, decline in morale of the investors, unemployment decline in profitability of banks, non-availability of funds with banks for recycling due to blocking in units and decline in production. Therefore, it is necessary to attach high importance to prevention of sickness and rehabilitation of sick units. Potentially viable sick units should be revived and non-viable sick units should be liquidated to get funds for recycling without avoidable loss of time in decision – taking.

Definition of Sick Units

All the sick units may be grouped under the following heads :

Non-SSI Sick units i.e. sick Industrial companies falling within the ambit of Sick Industrial Companies (Special Provisions) Act, 1985 (SICA)

Non-SSI Weak units

Sick SSI units.

1. **Non – SSi Sick Unit i.e. Sick Industrial Companies covered under SICA**

In order to deal with the problems of sick industrial companies, Sick Industrial Companies (Special Provisions) Act, 1985 was enacted. In the light of the experience gained, the above Act was amended in certain respects by Sick Industrial companies (Special Provisions) Amendment Act, 1993 which had received the assent of the president on 1st February, 1994. As per Section 3 (1) of the amended Act "Sick Industrial Company means and industrial company (being a company registered for not less than five years) which has at the end of any financial year accumulated losses equal to or exceeding its entire net worth". It may be clarified that an industrial company existing immediately before the commencement of the Sick Industrial Companies (Special Provisions) Amendment Act, 1993, registered for not less than five years and having at the end of any financial year accumulated losses equal to or exceeding its entire net worth, shall be deemed to be a sick industrial company. The amended act has also defined potentially sick industrial company. As per section 23(1) of the amended Act, an industrial company may be considered as potentially sick industrial company if its accumulated losses at the end of any financial year have resulted in the erosion of fifty per cent or more of its peak net worth during the immediately preceding four financial years.

It may be mentioned that for the purpose of the above definitions, 'net worth' means total of the paid-up capital and free reserves. 'free reserves' means all reserves credited out of the profits and share premium account but does not include reserves credited out of the revaluation of assets, write back of depreciation and amalgamation.

The following aspects should be considered while classifying a company as sick industrial company for the purpose of the Act:-

Small scale/Ancillary units are outside the purview of the Act.

A company registered under the Companies Act, 1956 either as a Private Limited Company or as a public Limited Company comes under the purview of the Act whereas partnership firms and proprietorship concerns are outside its purview.

A five-year span should have elapsed from the date of the company's incorporation to the latest financial year end.

The company should have carried on manufacturing/production activities of any of the items listed in the first schedule to the Industries (Development and Regulation) Act, 1951, in one or more of its factories. However, it should not be an industry relating to 'ships and other power-drawn vessels'.

Where a receiver or an Official Liquidator has been appointed in any proceedings pending immediately before the commencement of the Act in any High Court for winding up of the company, such companies are outside the purview of the Act.

It may be mentioned that Govt. companies having State or Central Govt. shareholdings of 51 percent or more were outside the purview of the Act in the beginning. However, they have been brought within the purview of the Act by an amendment afterwards.

Sick Industrial companies covered by the definitions have to be dealt with as per the provisions of the Act. Banks should review all cases of sick industrial companies and potentially sick industrial companies financed by them to ascertain which of them falls within the above mentioned revised definitions of a sick industrial company or a potentially sick industrial company and take necessary action in accordance with the relevant provisions of the Act. It may be mentioned that under the provisions of Section 23A(1) of the amended Act, a public financial institution or a scheduled bank may also report the cases of potentially sick industrial companies to the Board for Industrial and Financial Reconstruction (BIFR).

II Non-SSI Weak Units

It may be observed from the above definition that Act does not cover all the units having sickness. It does not cover partnership firms and proprietary concerns. In order to facilitate remedial action by banks at an early stage for such units, which are not covered by the Act, the Reserve Bank decided to adopt a definition of 'Weak' units. An industrial unit is defined as a 'Weak' unit if its accumulated losses at the end of any accounting year, resulted in the erosion of fifty percent or more of its peak net worth in the immediately preceding four accounting years. If the matter relating to a 'Weak' industrial company is

referred to BIFR in terms of section 23A(1) of the amended Act as mentioned earlier, it should be termed as a potentially sick company.

It may be clarified that weak units include all categories of borrowers i.e. limited companies, partnership firms, proprietary concerns, etc. It may be further clarified that this classifications into sick industrial company and weak units will not apply to SSI units.

III Sick Small Scale Industrial Units

Although sickness in the large, medium and small scale industrial units have many common features, the problems of small scale industries have to be dealt with keeping in view the relative weakness of small scale and tiny sector. Therefore, a separate definition has been given by the Reserve Bank for sick units falling in small scale and tiny sector. A small scale industrial unit may be classified as sick when (I) any of its borrowal accounts has become a 'doubtful' advance, ie. principal or interest in respect of any of its borrowal accounts has remained over due for a period exceeding 2 ½ years, and (ii) there is erosion in the net worth due to accumulated cash losses to the extent of 50 percent or more of its peak net worth during the preceding two accounting years. In the cases of the tiny/decentralised sector also, a unit may be considered as sick if it satisfies the above definition. However, in the case of such units, if it is difficult to get financial particulars, a unit may be considered as sick if it defaults continuously for a period of one year, in the payment of interest or instalments of principal and there are persistent irregularities in the operation of its credit limit with the bank.

Process of Sickness

Sickness is phenomenon which does not erupt all sudden but it is a gradual process of erosion of some of its functional areas. Every loan account is assumed to be regular at the time of disbursement at least from going concern approach. However, in course of time due to various reasons abnormality may develop in any of the functional areas like production finance, marketing, management etc. As a result of the above some defects may be observed in the normal functioning of the unit. These are known as 'warning signals'.

Warning Signals

When a unit is moving towards sickness, several adverse features may develop in the normal functioning of the unit, which are sometimes also latent at

the initial state. An experienced banker can sometimes draw conclusions even on the basis of the ledger position of the loan account.

This is not a very healthy feature. On the basis of the statistical experience, it has been observed that whenever a unit develops sickness or there are some problems in production/sale, the movement of the stocks will be as above. As such, the banker should immediately be put on guard. This type of inference can be drawn merely on the basis of the comparative position of a loan account available in the bank records without any co-operation from the borrower.

Let us assume, the position of loan account of an industrial unit is as under.

Limit sanctioned		Value of security		Drawing Power		Balance Outstanding		(Rs. in lacs)
Nature	Amount	Dec.	Dec.	Dec.	Dec.	Dec.	Dec.	
OD	10	95	96	95	96	95	96	
		18	18	10	10	10	10	

Apparently, the unit does not show any sign of irregularity. But, now let us take the composition of stock-statement of security worth Rs.18 lacs on both the above dates:

	Dec.	Dec. '96
Raw materials	8.00	4.00
Stock-in-progress	4.00	6.00
Finished goods	5.50	7.00
Spares	0.50	1.00
	18.00	18.00

This shows the movement of stocks is as under:

Raw materials	....	decreasing
Stock-in-progress	....	increasing
Finished goods	....	increasing
Spares	....	increasing

This is not very healthy feature. On the basis of the statistical experience, it has been observed that whenever a unit develops sickness, or there are some problems in production / sale, the movement of the stocks will be as above. As such, the banker should immediately be put on guard. This type of inference can be drawn merely on the basis of the comparative position of a loan account available in the bank records without any cooperation from the borrower.

In general, the warning signals from a unit tending towards sickness can be as follows:

1. Operational:

- ❖ Operations of the account are not healthy. Sale proceeds are not deposited regularly. There are no fluctuations in the account. The account generally remains dormant or even overdrawn due to the non-payment interest.
- ❖ Borrower is not prompt in submission of stock statement. Even if the same is submitted the stocks are generally overvalued for getting more finance from the bank.
- ❖ Borrower is not co-operating with the bank and does not submit the financial information or regularise the account.
- ❖ There is very often request from the borrower for sanction of temporary limits or enhancement of limits. It shows that the borrower is facing some financial difficulty.
- ❖ Borrower is not prompt in making payment of interest charged in the loan account. He also does not make payment of term loan instalment in time.
- ❖ Borrower is not in a position to meet obligations of statutory liabilities like P.F., Gratuity, Bonus and even wages and salaries to workers.

Operation in the bills (receivables) amount of the borrower are highly unsatisfactory.

Several unhealthy features have developed like:

Over detention

Large number of frequent returnings

Drawings of accommodation Bills

Drawing of bills on self / allied or association firms / sister concerns etc.

2. Financial

The financial position of the borrower gets continuously deteriorated. It is manifested in many ways as under:

- Gradual reduction in production sales and profitability.
- Gradual increase in sundry in debtors
- Corresponding rise in sundry creditors.
- Net working capital (NWC) slowly falls down and ultimately becomes negative.
- Erosion in nit worth due to continuous incurrence o r losses
- Initiation if legal proceedings by creditors etc.

3. Organisational set-up:

- Worsening position of industrial relations as the management is not in a position to meet the demands of the workers.
- High employee turnover thereby number of skilled persons starts leaving the unit.
- Major change in the share holdings
- Professional executives leave the organisation.

Causes of sickness

Some unit may be born sick owing to defective appraisal leading to wring projections of viability or certain problems faced during project implementation itself. Some units may become sick due to management deficiencies and causes internal them. Sickness may be thrust upon some units due to causes external to them. This causes of sickness can be broadly divided into two categories- internal and external. Internal causes are those causes on which can be controlled or avoided by the management of the unit. External causes are those causes on which the management of the unit has no control and they are due to external factors. It is very difficult to make watertight compartments between internal and external causes because sometimes management may be able to reduce adverse impact of external factors by proper planning and taking corrective steps at appropriate time. A unit may become sick due to internal/external factors relating to the problems of project implementation,

production, marketing, finance and administrative management which are summarized below.

	Internal Factors	External Factors
1. Project Planning	* Inadequate technical know-how. * Outdated Production process * Uneconomic size of projected * Under-estimation of financial requirements. * Unduly large investment in fixed assets. * Over estimation of demand. * Break-even point too high.	Locational disadvantage Defective viability study done by financial institutions Sanction of licences and financial assistance to many units leading to establishment of more units than required.
2. Project Implementation	(i) Project in implementation of project. (ii) Delay in placing order for machines. (iii) Inability of the promoters to bring in funds to the extent proposed (iv) Delay in tying-up-financial arrangements (v) Change in certain project concepts	Non-availability of land at the selected site. Non-availability / difficulty in procuring construction materials like cement, steel etc. Delay in delivery of machines. Delay in disbursement of assistance Delay in observing formalities relating to issue of shares.

	(vi) Siphoning of funds by the promoters.	Increase in project cost under different heads due to price escalation, under estimation of cost etc. Delay in getting power connections, permission of concerned authorities to discharge effluents etc.
3. Production	Inappropriate product mix. Poor quality control. Low utilisation of capacity. High cost of production. Poor inventory Inadequate maintenance of plant and machinery. Lack of timely and adequate modernisation. Lack of co-ordination between marketing and production planning.	Non-availability of raw materials or increase in the price of raw materials without a corresponding increase in sale price of the product(s). Non-availability of important infrastructure facilities like power, water, transport etc. Unsatisfactory performance of certain machines resulting in low production high rejection, rate etc. Obsolescence of the manufacturing process following technological developments.
4. Marketing.	Dependence on a single customer / single product. Lack of proper costing and pricing system. Inadequate efforts for sales promotion.	(i) Introduction of better substitutes (ii) Entry of many new manufacturers leading to cut-throat competition.

	Improper marketing and distribution systems. Non-Compliance with the delivery schedules causing annoyance to some buyers who may ultimately shift to another supplier for their requirements. Booking large orders without escalation clauses, although long time is required to execute them. Lack of market feedback and market research.	(iii) Market recession (iv) Obsolescence of the product following technological developments.
5. Finance	Low contribution from promoters High debt-equity ratio leadings to interest burden Lack of proper follow-up action for realisation of debts. Lack of proper planning to pay the creditors. Diversion of working capital funds for acquisition fixed up asset. Investments in sister concerns Liberal dividend policy Over-trading.	Non-availability of adequate finance Credit restrictions

6. Administration and personnel	Dissention within the management. Absence of manpower planning. Poor industrial relations. Over centralisation. Lack of feed-back to management (Management information System). Lack of co-ordination and control. Incompetent management Dishonest management. Priority of production and neglected marketing / finance.	(i) Natural calamities (ii) Political (domestic well as international) (iii) Change in government policies regarding. Price of raw materials fiscal duties, prices of finished products, restrictions on exports imports withdrawal of tax concessions etc.

The above causes of sickness are inter related. A unit may start incurring cash losses owing to one or more of the above causes.

REHABILITATION OF SICK UNITS

Rehabilitation means taking suitable measures to bring a sick unit back to health / sound footings. The best time for corrective action is when the sickness is at the incipient stage. Thus identification of sickness and knowledge of real cause for the same are pre-requisites before taking any action. The next step is to conduct the detailed techno-economic viability study to establish viability of the unit. Generally the viability study of a sick unit is undertaken by the bank by its own technical staff. The help of small industries service institute (SISI) or Technical Consultancy Organisations (TCO) can also be taken. The basic point that should emerge out of the study is that the unit is potentially viable.

If a unit becomes sick, financial institution / banks may have to examine whether it can be revived. Efforts should be made to revive only those sick units which have chances of becoming viable. Incase of MEDIUM and LARGE industries a unit may be regarded as viable if after implementing a relief package spread over a period not exceeding seven years from the commencement of the package, it would be in a position to meet its repayment obligations as agreed upon including those forming part of the package without the help of the concessions after the above-mentioned period. The repayment period for the restricted debts should not exceed ten years from the date of implementation of the package.

In the case of small scale industries, a unit may be regarded as viable if after implementing a relief package spread over a period not exceeding five years from the commencement of the package, it would be in a position to meet its repayment obligations as agreed upon including those forming part of the package without the help of the concessions after the above mentioned period. The repayment period for restructured debts should not exceed seven years from the date of implementation of the package. In the case of tiny / decentralised sector units, the period of reliefs/ concessions and repayment period of restricted debts should not exceed two years and three years respectively.

In order to ascertain the viability of a unit, detailed technical, commercial, financial and management appraisal should be done and estimate should be prepared to find out whether sufficient profit will be generated to satisfy the criteria fixed for viability.

TECHNICAL APPRAISAL

(i) Ascertain whether there have been any changes in the manufacturing process being used by unit. If a new process has been developed which is more economical, make cost-benefit analysis of the new process.

(ii) Estimate the production capacity of the various sections of the plant and examine whether it is worthwhile to increase the capacity in any particular section without involving large investment.

(iii) Examine whether there is any need to change the product mix and if so what will be the cost of additional equipments required for changing the product mix.

(iv) Study the present plant layout to ascertain whether it needs any changes to save time for handling material and equipments.

(v) Examine whether any major repair / replacement / balance in equipment is required and also indicate the finance required for that.

(vi) Study sources and availability of essential, inputs like raw material, water, power, fuel etc., and indicate necessary steps for their procurement.

(vii) Examine whether it is worthwhile to change the location of the plant. Changing should only be suggested when it is practicable.

COMMERCIAL APPRAISAL

Examine the present marketing strategy adopted by the unit and suggest necessary changes in its pricing policy, packing, transportation, distribution channels, advertising and sales promotion techniques.

Find out whether changing the product mix is necessary to suit the marketing requirements. Profit margin on different items of production may ascertained and product mix may be changed to maximise the profit keeping in view the demand for various products.

FINANCIAL APPRAISAL

Ascertain present financial position of the unit after determining the realisable value of assets.

Examine current liabilities to indicate pressing creditors and find out the immediate requirements.

Carryout a detailed analysis of current assets. Examine stock of raw materials and finished goods to ascertain whether any item has become obsolete and is not showing any movement. Similarly age of debts may be ascertained to find out whether any debts are outstanding for a long time and if so steps taken by the unit to realise them may be ascertained.

Ascertain total cost of the fixed assets required for the repair / modernisation / expansion / diversification programme suggested under technical appraisal.

Estimate total working capital requirements to carry out the production at expected level of capacity utilisation.

Indicate the sources of funds for meeting the above requirements fixed assets, working capital and repayment of pressing creditors. Total requirements of funds should be matched with the source of funds to be provided by them. If any asset may be used for rehabilitation programmes. After ascertaining total requirements of funds and other sources of finance available the amount of additional working capital and term loan to be provided by banks and financial institutions should be decided in such a way that total requirements of funds may match with the sources of finance.

If any scheme for amalgamation or merger is proposed, its feasibility should be studied.

After ascertaining the real value of assets, find out the extent to which present advances are secured. The position of security after provideing additional funds and creating additional assets may also be ascertained. However, security alone should not be the criterion for financing the rehabilitation programme. It should be decided on the basis of viability of the programme.

Draw the repayment schedule for existing loans and additional term loans keeping in view the future cash generation of the units.

MANAGEMENT APPRAISAL

Suggest necessary changes in the present organisational set-up of the unit.

If integrity of the management is doubtful it is necessary to change the management or at least appoint a suitable officer in the unit as representative of banks and financial institutions to monitor expenditure.

If it is felt that an incompetent person is occupying a very high position, it is better to change him a appoint a competent person in consultation with banks and financial institutions.

If a unit is having excess staff or labour, provision should be made in consultation with their association / union to reduce the number. Provision may also have to be made for the payment of compensation, if retrenchment is necessary.

Review the existing system of maintaining of books of accounts and other records and suggest necessary changes. Have an effective management information system to monitor the implementation of the rehabilitation programme.

RBI GUIDELINES ON REHABILITATION OF SICK UNITS

Existing Cash Losses

Funded interest term-loan (FITL)

The amounts of interest already debited to the cash credit and term-loan accounts but not recovered may be funded. This should be repayable within 3 to 6 years and interest to be charged on the same should be minimum 10% per annum and its repayments should have precedence over other dues. As this is a clean loan maximum permissible repayment is 7 years.

Working Capital term-loan

The irregular portion of the working capital loan excluding interests should be funded separately. This should also have a definite repayment schedule of not more than 7 years.

Penal Interest

Penal interest already charged in the account may be waived.

ADDITIONAL FINANCIAL ASSISTANCE

Working Capital: Need based further working capital finance can be provided by the banks.

Promoters Contribution: The minimum promoter's contribution should be (a) 15% in case of change in management or professional management (b) 20% in other cases. However, a relaxation has been given that out of the above minimum quantum, at least 10% is to be brought immediately and balance amount (5% or 10% as the case may be) within a maximum period of 6 months.

SHARING BETWEEN BANKS AND FINANCIAL INSTITUTIONS

(i) The requirements to meet a part of sundry creditors, statutory liabilities, salaries and wages of workers etc are to be shared between the banks and financial institutions on equal basis.

(ii) The start-up expenses, a part of the future cash-losses and margin for future working capital should be provided by the financial institutions. However, if such institutions are not involved in the project, the amount should be borne by IRBI.

RIGHT OF RECOMPENSATION

In the loan agreement to be executed by a borrower at a time of rehabilitation a clause must be added that the bank has a right of compensation after the unit has started to earn profit.

Similar concessions with much liberalised terms can be offered to sick units in small scale sector. An additional relief by way of contingency loan assistance upto 15% of cost of rehabilitation can also be sanctioned to such units. The interest on this loan will the same as charged on working capital advances.

Sacrifices to be made by others

Besides the sacrifices to be undertaken by the bank, it is necessary for revival of a sick unit that certain reliefs and concessions are also granted by various agencies involved in the process. This is very important as the unit will never be in a position to come to health if some reliefs / concessions are not granted at the operational level. The sacrifices required to be made by the various agencies can be summed up as under.

* **Management**

  Bringing in further funds / capital

  Write – off of loan

  Reduction in remuneration.

  Agreeing to provide further security and personal guarantee.

  Agreeing to appoint financial controllers / internal auditors / directors of banks / Financial Institutions on Boards.

  Reconstitution of management by bringing in professional.

* **State Government**

  Preferential treatment to the unit in the matter of supply of raw material quota, power connection, availability of all other critical inputs and above all an assured market.

Providing sales tax loan either at nil or very nominal interest rate.

Taking expeditious steps to solve the industrial relation problems.

Providing concessions in the rates of sales-tax, octroi duty, and other levies.

Considering giving government guarantee in respect of fresh advances.

Rescheduling of power-dues on a pragmatic basis considering the internal generation of surplus.

Providing adequate financial support by way of equity participation to the units which have been taken over by the state under IDR Act through budgetary provisions or support from SIDs / SIICs.

Waivement of penal levies.

* **Central Government**

Price-preference and reservation of quota for purchase by government / semi government organisations.

Deferment of PF and waiver of penalties, income tax and ESI dues, partial or full exemption from Central Excise.

Preferential allotment of canalised items for the purpose of import of raw materials.

Providing interest-free loans on equity participation especially in respect of those industries survival of which is in the national interest.

Labour Force:

Agreeing for increasing productivity

Wage freezing or establisation and sometimes agreeing for wage reduction also.

Deferring of payment of terminal benefits.

Voluntary agreement for schemes for rationalisation / retrenchement of surplus unproductive staff.

MONITORING OF NURSING PROGRAMME

Close monitoring of the rehabilitation programme is necessary for its success. Monthly reports should be called for from the unit regarding the progress of he rehabilitation programme. It may be ensured that additional funds provided to the unit are used according to the rehabilitation programme. Necessary steps should be taken to ensure that the unit is rehabilitated to the programme envisaged.

Self Assessment Questions

1. What are the special features of Project Review by World Bank?
2. Describe the review process of an industrial project.
3. How the financial review can be made successfully?
4. Why project review should be made?
5. Explain the process of evaluation of project management system of an organisation.
6. How will improve the performance of project management.
7. Give an overview of project management environment in a developing country like India.
8. What do you mean by techno economic viability study?
9. What is EITL?
10. Explain the various steps involved in the rehabilitation of sick units.

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MODEL QUESTION PAPER

Paper 4.2: TOURISM PROJECT MANAGEMENT

Time: 3 Hours Max. Marks: 100

SECTION - A (5 x 8 = 40)

Answer any Five questions

All questions carry equal marks

1. What is PERT? State its conventions.
2. What are slacks and floats in drawing network diagram. What is project scheduling? State its significance.
3. Distinguish between PERT and CPM.
4. What do you mean by the term project appraisal? Explain its significance.
5. What are the essentials of market appraisal process?
6. What is meant by abandonment analysis?
7. What are the special features of Project Review by World Bank?
8. Why project review should be made?

SECTION - B (4 x 15 = 60)

Answer any **Four** questions

9. Give an overview of project management environment in a developing country like India for tourism industry.
10. What do you mean by feasibility study? Explain the different components of feasibility study.
11. Explain the process of project identification while locating tourism attractions.
12. Discuss the process of social Cost Benefit Analysis. State its significance in ensuring the suitability of tourism attractions.
13. Explain the process of evaluating financial aspects of tourism accommodation (Hotel) project.
14. Describe the process, merits and demerits of applying CPM in any category of tourism industry.
15. Explain the process of evaluation of project management system of an organisation.

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